COMMERCIAL FISHERIES Review

DIV. OF FISHES

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COVER: Captain of gill netter checks his catch.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

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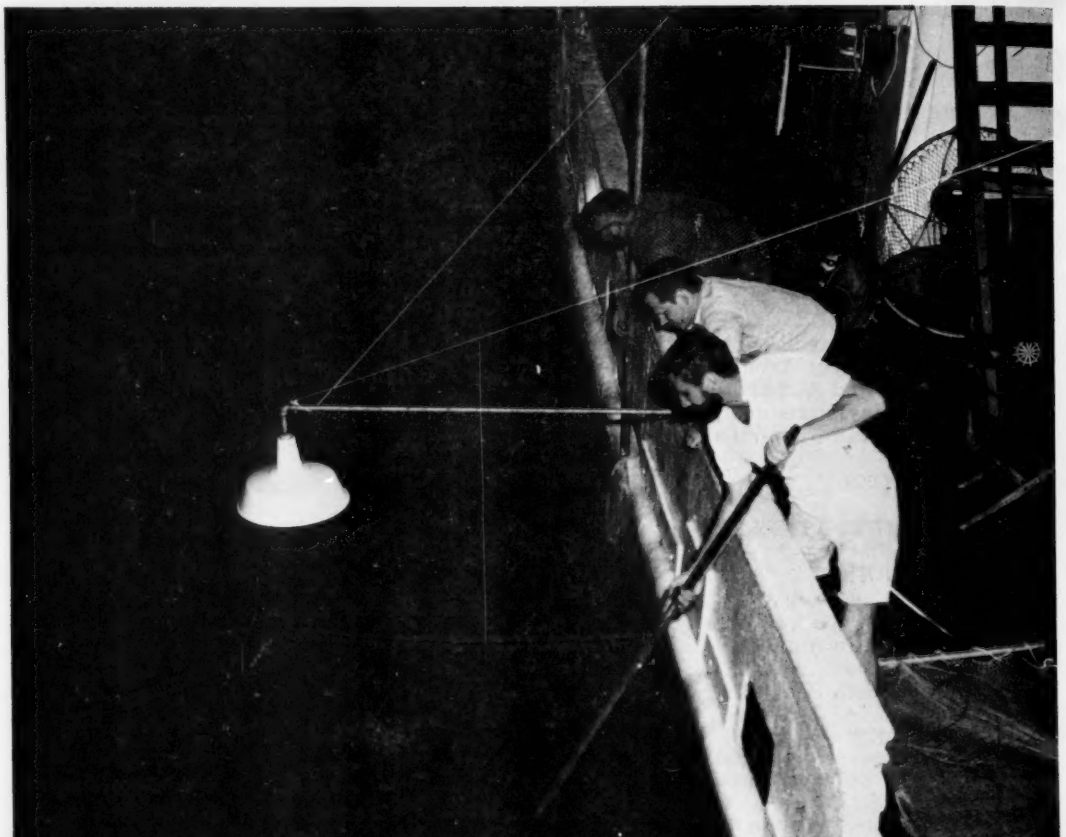


Dip netting at a light attraction station aboard the BCF research vessel 'Oregon'. (Photo: T. Iwamoto.)

GOALS FOR DECADE OF OCEAN EXPLORATION OUTLINED

Objectives for U.S. and world participation in an International Decade of Ocean Exploration during the 1970s are set out by the National Academy of Sciences and the National Academy of Engineering in a new report, "An Oceanic Quest". The report emphasizes the development of U.S. programs that could contribute to the Decade. It analyzes 4 major areas of ocean use: Biology & Living Resources, Geology & Nonliving Resources, Physics & Environmental Prediction, and Geochemistry & Environmental Change.

The concept of the Decade was proposed by President Johnson on March 8, 1968, and described in the May 1968 report of the National Council on Marine Resources and Engineering Development. The Council later asked the Academies to advise on the scientific and engineering aspects of U.S. participation.

The report also emphasizes the need for improved technology to carry out the U.S. mission. Nearly all of the U.S. oceanographic capability--including personnel, facilities, platforms, and special installations--would have to be upgraded.

The report cautions "that if much less than $100 million of new money per year (averaged over the Decade)" is made available for the projects discussed, "it would be undesirable to identify the set of programs as an International Decade of Ocean Exploration." To implement all programs, "as much as $500 million" a year is needed.

THE REPORT

The report proposes this basic objective for the Decade: "To achieve more comprehensive knowledge of ocean characteristics and their change and more profound understanding of oceanic processes for the purpose of more effective utilization of the ocean and its resources."

Despite the emphasis on utilization, it continues, "anticipated benefits are long-term in nature, and justification of the Decade goes beyond immediate economic returns."

These are the four areas covered by the report and the major recommendations:

I. BIOLOGY & LIVING RESOURCES

U.S. Fisheries

- Explore and assess the production potential of many living resources in the Gulf of Mexico and Caribbean Sea and Gulf of Alaska.

- Explore ocean stocks of tuna and tuna-like fish, especially skipjack, in the Eastern and Central Equatorial Pacific. Devise ways to utilize them.

- In Northwestern Atlantic, where many nations fish many species, investigate the interactions. This will provide basis for management policies.

International Fisheries

- Explore "production potential of the oil sardine, mackerel, shrimp, and other fisheries stocks of the Arabian Sea." Encourage countries bordering sea to use more of these resources.

- Investigate potential of krill and deep-water fishes of Antarctic Ocean. Devise ways to extract and to get them to world markets.

- Assess fishery resources of southern Chile and Argentina (in cooperation with local

governments), especially those in semiprotected fjords, where local industries might be encouraged.

• Cooperate with local governments to explore and assess fishery resources--especially stocks of demersal fishes and prawns--of Indonesian archipelago's continental shelf.

II. GEOLOGY & NONLIVING RESOURCES

Continental Margins

• International cooperation to reconnoiter emerged and submerged continental shelf of Atlantic's eastern margin, from northern Norway to Cape of Good Hope. Measure continuously "seismic, magnetic, and gravity parameters, and with bottom sampling and coring, along lines spaced at 50-mile intervals."

• International cooperation in "geological-geophysical surveys of the contiguous shelves and slopes of different countries."

• Help coastal states in "detailed hydrographic surveys in nearshore waters and harbors."

• "Cooperative hydrographic survey and charting of the continental margins."

Small Ocean Basins

• Conduct geological-geophysical investigations of selected basins--Mediterranean, East Indies, Red Sea--to assess mineral-resource potential, especially petroleum.

• Continue deep-sea drilling program. Emphasize small ocean basins and continental margins.

Ridges & Trenches

• On mid-ocean ridges, especially Mid-Atlantic, conduct geological and geophysical studies. These should involve "precise navigation and hard-rock sampling capability with manned and unmanned devices"--and surveys for metal-rich brines.

• Study a trench at a continental margin (Peru-Chile Trench). Dredge and core at sea and sample on land. Conduct geophysical profiles at sea and on land. Carry out "detailed earthquake seismology studies of submarine earthquakes using land-based seismometers."

III. PHYSICS & ENVIRONMENTAL PREDICTION

Monitoring

• Use more ships-of-opportunity and aircraft to collect near-surface oceanographic data. Encourage developing nations to set up "simple shore stations of standard design."

• Establish more-permanent "ship and island midocean monitoring stations." These should include heavily instrumented island observatories.

• Investigate requirements of "an effective system for oceanographic monitoring of the North Pacific."

• "Support pilot studies of new monitoring techniques, such as free-fall transport measuring devices, moored current-meter arrays, deep-sea bottom-pressure records, and air-dropped expendable and retrievable instrument packages."

Air-Sea Interaction

• In Western Indian Ocean, investigate ocean's reaction to monsoonal changes in winds. Use existing numerical model to design observational program.

• In Western Pacific and China Seas, use existing data to build preliminary numerical model.

• In Equatorial Pacific, carry out observational program. Use research vessels, buoys, ships of opportunity, planes, and island stations to explain "large-scale, long-term, ocean-atmosphere interaction."

Deep Ocean

• "Complete world coverage of deep-water temperature, salinity, and dissolved-oxygen measurements. Obtain direct measurements of deep-water flow in selected locations."

IV. GEOCHEMISTRY & ENVIRONMENTAL CHANGE

• "Conduct geochemical survey of selected chemical and radio-chemical substances on meridional traverses in the Atlantic, Pacific, and Indian Oceans."

• Monitor the rate that natural and man-made substances are added to the ocean by rivers and winds.

WHAT TYPES OF ORGANISMS, OTHER THAN SHARKS, ARE POTENTIALLY DANGEROUS TO SWIMMERS?

The most dangerous animal other than sharks is probably the barracuda; indeed it is feared more than sharks by West Indian divers. Its usual length is only 4 to 6 feet, but it is aggressive, fast, and armed with a combination of long canines and small teeth capable of cutting as cleanly as a knife.

Although no authentic record of deliberate attacks on man exists, the killer whale is potentially more dangerous than either sharks or barracudas. This carnivore measures 15 to 20 feet and hunts in packs. It attacks seals, walruses, porpoises, and even baleen whales.

The moray eel, which is as long as 10 feet, lurks in holes in coral reefs and may inflict severe lacerations on a diver who pokes his hand into its hiding place, or it may grasp the diver in its bulldoglike grip until he drowns.

The octopus is probably overrated as a villain because of its evil appearance; nevertheless, its bite is poisonous. The giant squid has been known to pull man beneath the water to his death. The Portuguese man-of-war has tentacles up to 50 feet long with stinging cells which are painful to a swimmer brushing against them.

There is a large group of animals dangerous to swimmers or waders who step on them. These include the sting ray, stonefish, zebra fish, toadfish, and many others. The giant tropical clam (Tridacna), weighing as much as 500 pounds, has been depicted as trapping divers; however, no authentic records exist. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

UNITED STATES

BCF and Industry Promote New England Pollock

BCF and industry are cooperating in a campaign to shift emphasis from the depleted haddock resource to the underutilized pollock resource. BCF marketing personnel have been assigned to the haddock marketing area.

BCF personnel have made numerous personal contacts in the attempt to fill the market void created by the lack of haddock. As a result, industry has placed sample orders for pollock with chain stores, wholesale distributors, institutional feeders, and restaurants. Most of these establishments want to find out how their customers will react to pollock before committing themselves to large orders. A few already have agreed to accept regular shipments.

Much Publicity

The food chains in particular are anxious to tie in their efforts with the campaign. Many food editors and home economists have agreed to publicize pollock by feature stories, recipes, and fish-cookery demonstrations.

BCF also is conducting short-term explorations and gear testing to assist industry in providing a continuous supply of pollock.

Haddock Abundance Drops Further

A spring groundfish survey completed by BCF's 'Albatross IV' on April 10 showed a further drop in haddock abundance. The vessel completed 270 otter-trawl hauls from Cape Hatteras, N. Carolina, to western Nova Scotia.

The average catch in pounds-per-30-minute haul was $\frac{3}{4}$ of the 1968 survey level and $\frac{1}{3}$ of 1966's.

The decline in BCF's abundance index for commercial-size Georges Bank haddock has continued since 1965. The same trend is seen in the catch-per-day indices of the U.S. haddock fleet.

Decline Inevitable

The decline was inevitable because of attrition of the last good year-class--the one spawned in 1963.

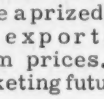
Haddock do not enter the fishery until 2 years old. However, BCF obtains an early indication of the incoming year-class size by measuring, each July, the abundance of 4-month-old haddock on Georges Bank.

'Oregon II' Discovers Scarlet Prawns Off Northeastern South America

Experimental trawling by BCF's Oregon II on the Continental Slope off Surinam and French Guiana revealed concentrations of giant scarlet prawns (bright red shrimp) yielding under 20-count tails. The total catch for 13 successful trawl hauls in 350 to 450 fathoms was slightly over 2,000 pounds. The largest single catch was 404 pounds. This species is presently fished only off West Africa by Spanish deep-sea trawlers. The Oregon has shown that there are also concentrations of this species on the western side of the Atlantic Ocean.

Optimism for Fishery

The staff of BCF's Pascagoula (Miss.) Exploratory Fishing Base will continue to improve deepwater fishing techniques. They are attempting to at least double the catch per unit time--and to encourage and assist U.S. fishermen to begin harvesting this species. These shrimp are a prized delicacy in Europe. Small quantities exported to the U.S. have brought premium prices. This suggests no difficulty in marketing future U.S. production.



Silt Is Major Killer of Young Oysters

BCF Milford (Conn.) Biological Laboratory's SCUBA examination of local oyster beds in early spring shows that many beds accumulate a sufficient layer of silt during the winter to bury many young oysters. On May 1, for example, on one bed of 1966-generation oysters, many oysters, mostly doubles and singles, were buried under as much as a half-inch of bottom material. Most were still alive; only 3.6% had died because of smothering.

Another bed with a heavy population of 1968 seed oysters also had accumulated a heavy layer of silt. By May 1, 14.9% of the spat already had been killed; by May 16, however, mortality on this lot had increased to 33.1%, probably due primarily to smothering by silt--but also partly due to predation by rock crabs.

On other beds, indicated mortalities due to suffocation by silt range as high as 40 to 50%, or higher. Much of this mortality can be avoided by transplanting the oysters to beds free of silt during March, or early April, while the oysters still are essentially dormant.

Project Launched to Aid Delaware River Oysters

The Delaware River Basin Commission has launched a research project to rescue the Bay's sagging oyster industry. It has contracted with the University of Delaware for a 4-year $100,000 research project to apply a successful Japanese production technique to the Delaware.

The Commission said that Japan has become a major oyster producer in the last quarter-century by growing shellfish suspended in water rather than on sea bottom. Previously, Japanese oyster production had dwindled drastically, as it has in the U.S. The U.S. annual crop dropped 50% in the last half-century.

Delaware's Oyster Industry

In recent years, the Commission noted, the Delaware oyster industry has been "racing toward extinction." Annual production fell from 4.2 million pounds in the 1950s to only 34,000 pounds a decade later.

Much of the drop is attributed to a predatory snail, the oyster drill. Scientists who designed the research project believe that taking oysters off the bottom, where snails live, will eliminate the problem.

Under the "off-bottom" system, young oysters are suspended from rafts in the bay on racks, in bags, or by stringing the shells.

Besides lifting the shellfish out of the oyster drill's reach, a principal advantage of the off-bottom system is the use of the full depth of water--compared to the limited space available on the bottom. Also, much of the bottom is not suitable for oysters.

The Research Project

The research will include the control of marine organisms that compete with oysters for food and growing space and a study of oyster growth; evaluation of the oyster's market value; the local economics of the off-bottom method and location of good growing sites in Delaware Bay.

If the off-bottom research project is successful, the knowledge gained will be turned over to commercial growers. In Japan, more than 90% of the oyster crop is produced by the off-bottom system.

An oyster research project conducted by BCF in Massachusetts showed that off-bottom oyster growth is twice as fast and far more productive than the conventional method.

Whaling Catch Regulations Published

BCF has announced regulations for the U.S. whaling industry in the North Pacific Ocean for the 1969 season. The regulations, which became effective upon publication in the May 29, 1969, issue of the "Federal Register," limit the U.S. catch to 48 fin whales and 60 sei whales.

The quotas were recommended by the Commissioners of the North Pacific member nations of the International Whaling Commission. Whaling Commissioners from the U.S.,

Japan, the USSR, and Canada agreed that it would be necessary to establish limits for their respective countries for the North Pacific for 1969.

Underwater Research Vehicle RUFAS Makes Debut

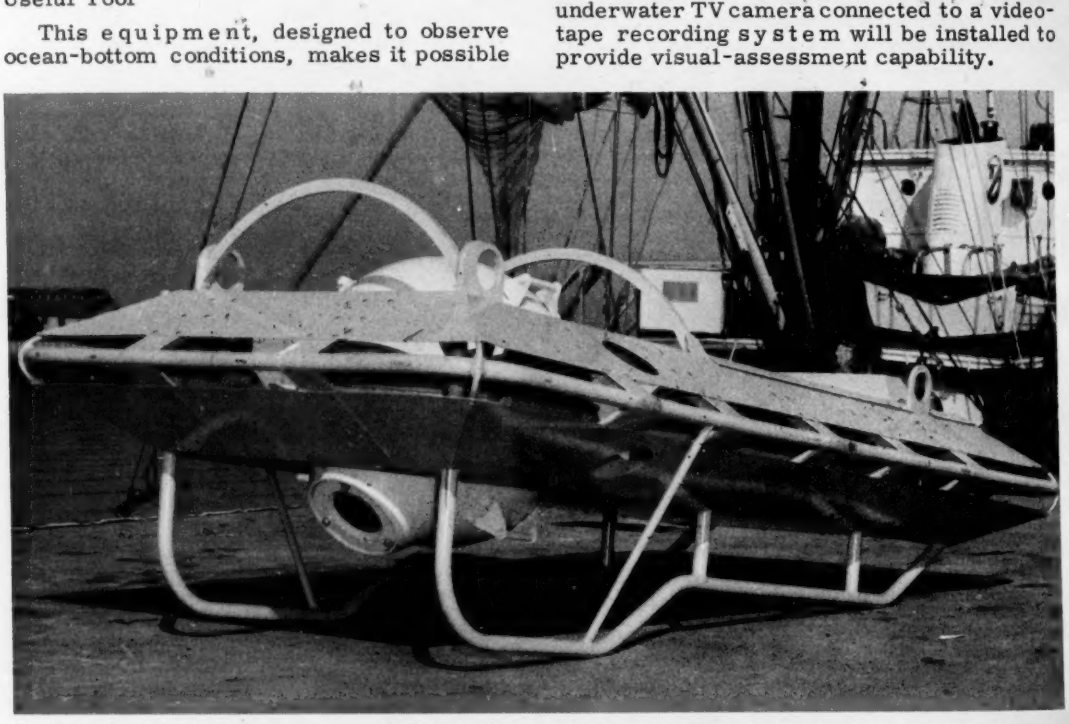
The remotely controlled underwater research vehicle named RUFAS, a cooperative effort of BCF's Pascagoula (Miss.) Base and the General Electric Co., Bay St. Louis, Miss., was scheduled to make its debut in June 1969. It will survey the Cape Kennedy calico scallop beds first delineated in the early 1960s by BCF.

Useful Tool

This equipment, designed to observe ocean-bottom conditions, makes it possible for scientists to predict availability, location, and patterns of scallop occurrences. Broader application of this new concept in fishery search and assessment will allow rapid and accurate visual evaluation of underwater objects, harvesting equipment, bottom topography, fauna, and flora. RUFAS is suited for monitoring many different subsurface biological activities.

The Vehicle

The Mark I model of RUFAS has an operational depth range to 300 feet at a 5-knot towing speed. It will have diving vanes controllable by cable from a tow vessel. This will enable it to dive, rise, and hold its altitude at any position above bottom. Underwater lights, vertical sounder for bottom reference, 16-mm. sequence camera, and underwater TV camera connected to a videotape recording system will be installed to provide visual-assessment capability.



Remote underwater fishery assessment system (RUFAS) developed at BCF Exploratory Fishing and Gear Research Base, Pascagoula, Miss., with General Electric engineers of Bay St. Louis, Miss.

Larval Tuna Fish Reared for First Time

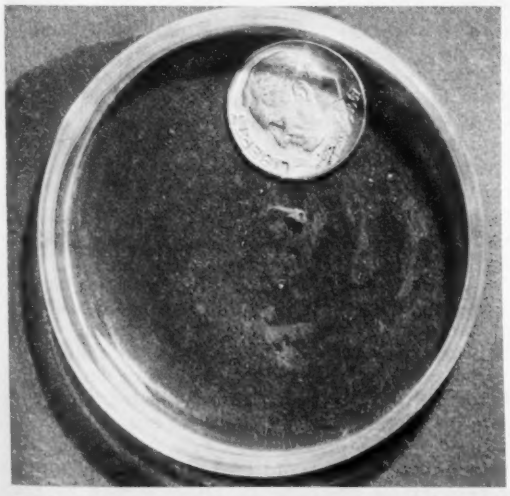
Months of experimentation by scientists at BCF's Tropical Atlantic Biological Laboratory (TABL) on Virginia Key, Florida, culminated at the end of May in the rearing of larval tunas beyond the yolk sac from eggs collected in the ocean. The scientists believe it was the first time anywhere.

Dr. Carl J. Sindermann, laboratory director, said the achievement was a breakthrough in tuna research. He cautioned, however, that it was only the first of many steps before scientists will know whether tunas can be reared to adulthood under artificial circumstances.

Dr. Sindermann said: "The tunas are remarkably contradictory fish. They are among the most rugged of the pelagic fish while in the sea, but once captured are extremely delicate and must be handled with the utmost care." He noted that although a few species of marine fish have been cultivated successfully outside their natural habitat in recent years, the scombrids (tunas and tunalike fishes) have presented almost insurmountable problems.

The Tuna Eggs

The tuna eggs involved in the TABL experiment were collected off Miami Beach, Fla., by biologist Dr. Edward Houde in a mixed catch of plankton. At first, Dr. Houde knew that he had several hundred fish eggs--but did not know what species they were. The tuna eggs were about $\frac{1}{25}$ of an inch in diameter and were not easily separable from eggs of other fish species. He placed some eggs in a large (140-gallon) tank of seawater, others in a smaller tank that contained a large amount of green algae called Chlorella. The alga is believed to sustain the minute zooplankton (microscopic animals) fish larvae eat.



Tuna (little tuna or bonito) larvae reared from egg at BCF's Tropical Atlantic Biological Laboratory, Miami. ('Miami Herald')

The next day, about 200 hatchlings could be seen swimming around in the Chlorella-laden tank. Many larval fish subsist initially on their own yolk sacs. Most of the TABL larvae survived for almost 2 weeks, or about 10 days beyond the yolk-sac stage. By the 14th day, only 6 fish were still alive, but these were feeding actively on zooplankton. Meanwhile, Program Leader Dr. William J. Richards had definitely identified the tiny fish--about $\frac{1}{4}$ inch long, almost transparent, bearing large heads, large black eyes, and big jaws--as members of the "little tuna" group, Euthynnus alletteratus, in the Atlantic Ocean. These are commonly called "bonito" by Florida fishermen.

Larval fish seldom look anything like their parents until they reach the juvenile stage. This is judged to be about $\frac{3}{5}$ of an inch in the case of the little tunas in the TABL experiment.

Laboratory scientists believe the larval tunas finally died because of a series of maladjustments: water temperature was slightly lower than the 78.8 to 80.6° F. required, the light on the tanks should have been brighter, and more acceptable zooplankton food should have been provided.

Second Attempt Underway

After the first collection of eggs had hatched, Dr. Houde and his assistant, Barbara Palko, were able to distinguish tuna eggs from others in a batch collected on June 3. They claim that identifying marks were the size of the eggs, the faintly amber color of the oil globule, and the distribution of pigment on the embryo (all visible under a microscope). The two biologists used the same methods to hatch the second collection of 1,000 tuna eggs. All the eggs hatched, but most of the larvae survived for only 2 to 4 days beyond the yolk-sac stage. Thirteen days after hatching, 6 of the larvae were still alive and feeding on zooplankton, but then they also died--of unknown causes. Efforts will be made in continuing culturing experiments to determine just what combination of factors apparently conspire to cause, first, the high mortality of the newly hatched tunas and, second, the death at the end of about 2 weeks of the seemingly healthy survivors.

Dr. L. L. Glasgow Testifies on Pollution by Pesticides

Dr. Leslie L. Glasgow, Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources, U.S. Department of the Interior, testified on the effects of pesticides on sport and commercial fisheries before the Subcommittee on Energy, Natural Resources, and Environment, Committee on Commerce of the U.S. Senate, May 19, 1969.

His statement follows:

We welcome the opportunity to comment on the effects of pesticides on sport and commercial fisheries because we are deeply concerned about the contamination of our environment by the use of pesticides. The recent discovery of high DDT residues in Lake Michigan coho salmon has brought the problem into national focus.

The current hearings in Wisconsin, sponsored by the Environmental Defense Fund and the Wisconsin Department of Natural Resources, have put pesticides on trial in that State. Hundreds of pages of testimony have been generated both for and against the continued use of DDT. Other States have taken actions to restrict DDT uses that have ranged from the elimination of certain use patterns to the outright ban of this chemical.

Lake Michigan Watershed

In addition to our own Departmental studies to develop information on the effects of pesticides in fish in Lake Michigan, we are working with other Federal agencies and the States to monitor the origin and the occurrence of pesticide residues in the Lake Michigan watershed. These collaborative activities will ensure the maximum utilization of talent and resources.

Sources of DDT in Lake Michigan have not been fully identified. DDT reaches the Lake from a variety of sources. More than 50 percent appears to come from urban uses where many factors contribute to the burden. A few of these are: control of Dutch Elm Disease, mosquito control, uses on home lawns and shrubbery, dry cleaning plants, wool treatment plants, sewage treatment facilities, and many more. We expect that the use of DDT in Michigan's fruit producing areas constitutes a potent agricultural source of this pesticide.

One objective of the Department of the Interior for all our water resources, for the Great Lakes and Lake Michigan, in particular, is to establish and preserve for future generations an environment that will produce healthy stocks of fish and wildlife. A major step in attaining this objective would be to stop the use of hard pesticides that are contributing to the contamination of Lake Michigan. The combination of physical and biological factors have made this body of water especially prone to pesticide pollution. While we recommend the elimination of persistent pesticides that contaminate the environment, we recognize that complete elimination at this time may not be practical or feasible. However, it is time to replace DDT with less hazardous pesticides. Continued use should not be permitted where environmental contamination occurs. Further, we should initiate the phasing out of other hard pesticides. They should be replaced by other less hazardous materials. We firmly believe that we should work toward this end; and that through cooperative efforts at all levels, solutions can be found to maintain both our food producing capability and an environment free from contamination.

Coho Salmon Seized

I would like to mention some of the pesticide problems that face our fisheries. The most dramatic are the economic implications of the seizure of coho salmon taken in Lake Michigan. The sport fishery on the Lake is valued at $200 million. Boats, tackle, motel rental and service industries have benefited enormously from the growth of salmon angling. The 1968 landed value of commercially caught coho salmon in the Lake was about $300,000. In that year, the Lake Michigan total commercial fish landings were valued at about $3 million. Under a recent ruling from the Food and Drug Administration, establishing DDT levels at 5 ppm in fish, these sport and commercial fisheries will be adversely affected.

The threat to the fishery resource through exposure to sub-lethal concentrations of pesticides is not nearly as striking as a major fish kill, but the effects of this exposure can be more significant. Existing evidence is adequate to demonstrate the relationship between present DDT levels in some fish and reproductive inhibition. Ten years ago in New York State trout in Lake George failed to reproduce because of DDT levels in the

eggs. We have evidence that a similar situation has occurred in sea trout in one of our estuaries.

Pesticides in Estuaries

The United States shrimp fishery is our most valuable fishery resource. Larval shrimp migrate in from the sea to the growing areas in our estuaries. We believe that the levels of pesticide pollution in the upper reaches of some estuaries of the United States are already so high that shrimp using them for nursery areas may be lost.

Since 1965, we have monitored the pesticide levels in our estuaries. Oysters and other mollusks are used as bioassay animals because of their efficiency in extracting and storing pesticides in their tissues. We have conducted over 6,000 analyses from about 170 stations, sampled monthly.

In general, all samples except those collected near the Canadian border show some degree of pesticide contamination, primarily, DDT. While none of the residue levels are high enough to constitute a human health problem, they could have a drastic effect on predatory animals in the estuary.

Pesticides Magnified in Food Chain

We also have evidence of secondary effects through magnification in the food chain. Pescide residues in fish are considered the most probable cause of the decline in hatching success in a colony of brown pelicans off the California coast this spring. Many nests contained eggs with collapsed, very thin shells. Experimental studies have shown that mallards fed DDT at low levels produce eggs with significantly thinner shells and hatch significantly fewer young than ducks fed untreated food.

Our evidence is increasing that persistent pesticides are hazardous to terrestial wildlife. It has long been established that the use of DDT to control Elm Bark Beetles results in accumulation of DDT in earthworms--many thousands of robins have been killed as a result of eating such contaminated worms.

Furthermore, we suspect that this type of pesticide treatment is responsible for the flushing of DDT into storm sewers and subsequent discharge into rivers and lakes.

Major River Systems Affected

The presence of DDT and dieldrin has been demonstrated in all major river systems of the country where it enters the aquatic food chain of many species of fish and wildlife.

Its subtle effect on reproduction and survival on many species of fish and wildlife are illustrated in the above-mentioned thinning of eggshells.

The Department of the Interior recognizes the complexities of pesticide pollution and, in cooperation with other Federal agencies and the States, has developed a monitoring program to identify the sources of contamination in the Lake Michigan watershed. The States have responded by curtailing the use of DDT in the watershed. At the Federal level, we are working with the Department of Agriculture to withdraw registration of hazardous use patterns of persistent chlorinated hydrocarbon pesticides.

In 1963, the President's Science Advisory Committee recommended the orderly phasing out of organochlorine pesticides. The Department of the Interior supports this position and is currently programmed to bring it about on all lands administered by Interior agencies.

Fishery Legislation Proposed in Congress

CONGRESS SHOWS INTEREST
IN "OUR NATION AND THE SEA"

On May 23, the President signed P.L. 91-15 continuing the National Council on Marine Resources and Engineering Development for one year, until June 30, 1970.

The Marine Resources and Engineering Development Act was enacted in June 1966. Its object was to develop, encourage, and maintain a coordinated, comprehensive, and long-range national program of marine science. It created a National Council of Marine Resources and Engineering Development, and a Commission on Marine Science, Engineering and Resources. The Commission was to make a final report in January 1969 and go out of existence 30 days later. Its report was titled: "Our Nation and the Sea." The Council was to expire on June 30, 1969.

One of the Commission's duties was to recommend a governmental organization plan and the estimated cost of it. This, with other Commission recommendations, was submitted to the President and Congress in early January. The report also contained 212 significant recommendations relating to many aspects of marine affairs.

The report of Chairman Garmatz, House Committee on Merchant Marine and Fisheries, stated: ". . . the fact, in view of the voluminous and comprehensive scope of the Commission's excellent report, that it is most unlikely that legislation establishing a new organizational structure for a national program in marine sciences can be enacted during the remainder of this fiscal year, it seemed . . . essential that the life of the Council should be extended for a reasonable period . . . to give Congress and the new administration a reasonable time to review and act upon the numerous recommendations."

Department of Marine Affairs

Already, the Commission's report has stirred several attempts to establish a Cabinet-level Department of Marine Affairs.

As early as January 16, Rep. Wilson, Calif., introduced a bill to establish a National Oceanographic Agency. Mr. Wilson commended the Commission's report for recognizing "the need for a coordinated attack on the unsolved problems of oceanography." He added: "We could make no better investment of the taxpayers' money than in oceanographic programs which will yield huge returns, provide greater understanding of our environment, and help further raise our national standard of living."

On March 25, Rep. Pepper, Fla., introduced H.R. 9482 to establish a Department of Oceanographic Services within the President's cabinet. This bill would coordinate and consolidate the major civilian marine functions of the Federal Government, enunciate national policies concerning the marine and maritime interests of the U.S., expand exploration of the sea, develop estuarine areas, and revitalize the U.S.-flag merchant marine.

On May 5, Rep. Anderson, Calif., introduced H.R. 10869 to establish a Cabinet-level Department of Maritime Affairs. He stated: "This bill would bring together and coordinate all U.S. commercial and governmental interests with respect to the sea."

On May 14, Rep. Dellenback, Oregon, introduced H.R. 11240 to establish the National Oceanic and Atmospheric Agency.

On May 20, Sen. Murphy, Calif., introduced S. 2204 to establish the National Oceanic Agency. It was cosponsored by Sens. Hatfield, Ore., and Tower, Tex.

Sen. Murphy said: "The truth is, however, that up to this time, we have only dipped into ocean exploration and development . . . the time has come when we must reorganize our Nation's oceanology program for the plunge . . . the time has come when oceanology must be given the priority it deserves."

The Subcommittee on Oceanography, House Committee on Merchant Marine and Fisheries, has been holding a series of hearings since April 29 on a national oceanographic program. The report of the Commission on Marine Science, Engineering and Resources has received much attention.

--Barbara Lundy

OCEANOGRAPHY

'GOFAR' Scientists Discover Salt Domes in Eastern Atlantic

Scientists of the U.S. Naval Oceanographic Office (NAVOCEANO) have discovered salt domes--geologic structures known to accumulate oil--in deep ocean sediment of the eastern Atlantic. Previously, these structures had been found only on continental-shelf areas, where petroleum companies now are concentrating all offshore drilling operations.

The discovery was reported to the recent convention of the American Association of Petroleum Geologists in Dallas, Texas, by Lt. Eric Schneider, a research geologist who heads the Global Ocean Floor Analysis and Research (GOFAR) project for NAVOCEANO.

May Affect Oil Searches

Lt. Schneider predicted: "The finding of domes along with organic-rich sediments (known to contain oil) may thrust the search for oil into the deep ocean areas. Our data show the domes to be located 400 miles west of Senegal and 180 miles north of the Cape Verde Islands (Africa)."

He said the GOFAR scientists believe the cone-shaped structures are salt domes because they have no magnetic signature--a test geologists use to identify sedimentary and igneous rock beneath the sea floor.

The structures appear to be pushing their way up out of the sediments underneath the sea floor; they also are located near "documented salt deposits on the Senegal continental shelf."

Data from USNS 'Kane'

The data were collected last summer when the USNS Kane, NAVOCEANO's most modern research ship, traveled 20,000 miles across the Atlantic from Bermuda to Liberia.

'GOFAR'

The GOFAR project is sponsored by the Navy. It is designed to increase man's understanding of the geological processes that formed and continue to mold the ocean floor.

Capt. T. K. Treadwell, NAVOCEANO Commander, explained: "The Oceanographic Office is interested in understanding these geological processes for the simple reason that it must provide the Navy and the marine community with accurate charts of the world's oceans. Regular soundings (depth measurements used to determine the topography of the ocean floor) are far more useful if we know the principles that determine the floor's features."

Coast & Geodetic Vessels Survey Alaskan Waters

Five U.S. Coast and Geodetic Survey ships are conducting extensive charting and ocean surveys in Alaskan waters this year. The 5 are: 'Fairweather,' 'Davidson,' 'Pathfinder,' 'Surveyor,' and 'McArthur'. Three ships left Seattle, Wash., their home port, in May; the remaining 2 were scheduled to sail in June. They will operate until fall.

The ships carry over 300 officers and crew and will collect information to benefit the increasing marine activity and economic development of Alaska's waterways. "Their survey data will be used for safe navigation of fishing and deep-draft cargo vessels, for locating oil-drilling sites, and for planning future mining, oil exploration, and waterfront construction."

The Plan

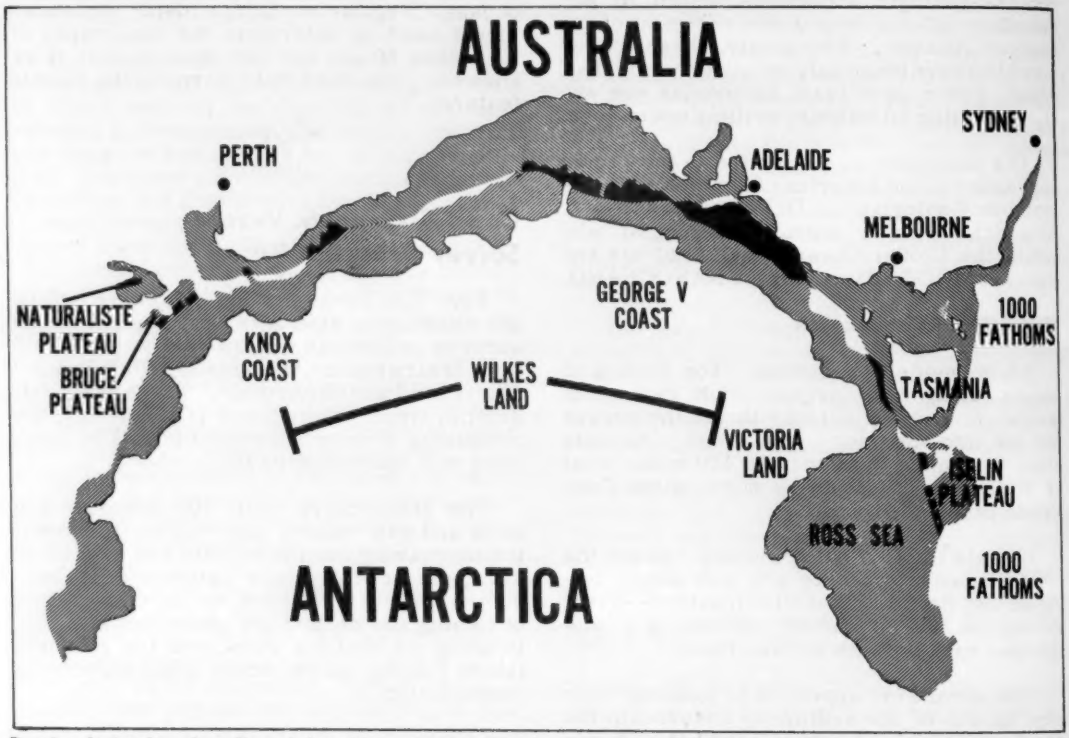
Four vessels will carry out hydrographic surveys several miles from shore. Their ship-based launches will determine depths in small inlets, bays, coves, and harbors. Their mission is to locate safe approach channels and anchorages; also, to determine the shallowest depth over navigational hazards, such as submerged rocks, shoals, reefs, and wrecks.

During winter, processing of survey data will begin for several new charts of the numerous sounds, bays, and harbors. Existing charts will be updated.

Australia and Antarctica Once Part of Supercontinent, U.S. Scientists Say

Two U.S. scientists report they have established that Australia and Antarctica, now separated by about 2,000 miles of water, were once part of an ancient supercontinent. The scientists, Walter Sproll and Dr. Robert S. Dietz, are geological oceanographers at ESSA's Atlantic Oceanographic Laboratories in Miami, Florida.

Sproll and Dietz processed oceanographic data obtained by U.S. and Australian scientists in 1967 during the global cruise of the 'Oceanographer.' The result, they say, was a "precise fit" between the 2 continents.



Drawing depicts how Australia and Antarctica were once part of an ancient supercontinent before it broke up and drifted apart 2,000 miles. Drawing is based on a computerized fit established by ESSA scientists from data obtained in 1967 by the U.S. Coast and Geodetic Survey Ship 'Oceanographer'. The diagonal lines represent the offshore underwater continental shelves of Australia and Antarctica; the solid black areas, the overlap of the two continents; and the white spaces, the underlaps.

U.S. Scientists Search Bottom of North Central Pacific

ESSA oceanographers have investigated 3 major underwater features to determine the history of the North Central Pacific basin. The study is part of a long-range program to unlock the secrets of the deep ocean.

The 3 features are: a newly discovered trough (the name "Emperor Trough" will be proposed); the Chinook Trough; and the Rat Island Fracture Zone(s).

ESSA explains: "Troughs are giant declivities in the ocean floor, while fracture zones are long bands where the sea bottom appears to have been broken, similar to the geologic faults found on land, such as the San Andreas Fault in California."

Project Purposes

The project was undertaken in April and May aboard ESSA's 'Surveyor'. The purposes were to determine the interrelationship of the 3 underwater features--and their relationship with the 'linear magnetic anomalies' found in the area. These anomalies are changes from the normal magnetic field observed on the earth's surface. They have been attributed to sea-floor spreading, a theory in which semimolten rock from the earth's interior rises and spreads laterally under the ocean floor. The theory ties in with that of continental drift. In this, the giant land masses are moved over the earth's surface. The magnetism in the semimolten rock is "locked in" when it cools. It furnishes a record of the distance it has traveled since it rose from great depth. The magnetized rock can be detected on the sea surface by ship-towed instruments.

Emperor Trough

The northwest-trending Emperor Trough was discovered in 1968 by scientists of ESSA's Pacific Oceanographic Research Laboratory in Seattle, Wash. They used data gathered principally by the Surveyor. The trough runs at a 40° angle to the Emperor Seamount Chain, a range of submerged mountains. "Data on the depth, width, and length of the Emperor Trough are expected to be made public shortly."

The Emperor Trough appears to be the northeastern boundary of the Mellish Rise. The latter is an elevation in the ocean bed lying east of the Emperor Seamount Chain. The chain runs north and south from near the western tip of the Aleutian Islands until it meanders south-southwest; it terminates west of Midway Island in the Central North Pacific.

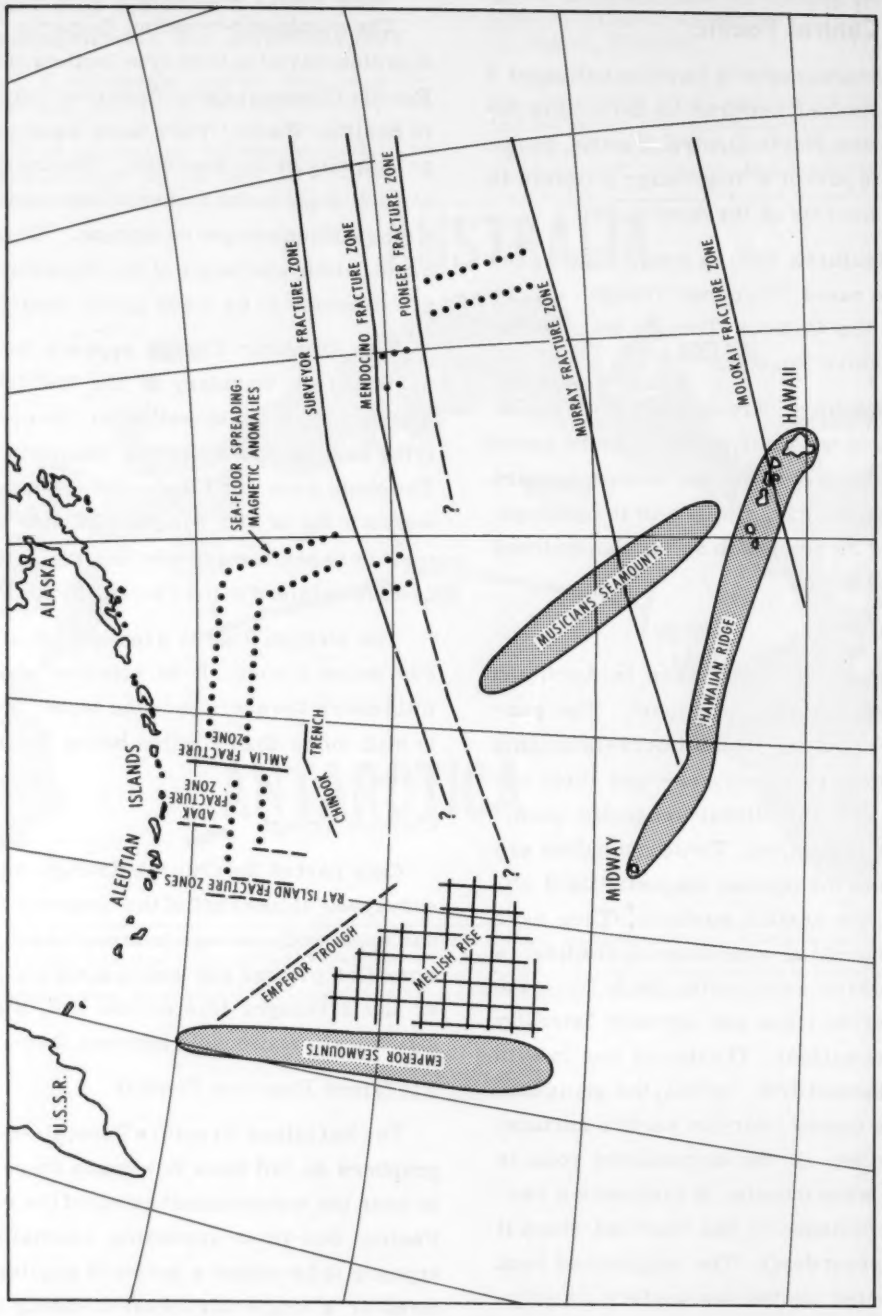
The Mellish Rise is a feature about 800 or 900 miles across. It is elevated about one mile above the average ocean depth. Its depth is still more than 3 miles below the ocean's surface.

Chinook Trough

Only part of the Chinook Trough has been surveyed. It lies east of the Emperor Trough and apparently swings in a southwest direction. One project aim was to discover whether the 2 troughs intersected and, if so, the structural relationship between them.

Rat Island Fracture Zone(s)

The Rat Island Fracture Zone(s)--oceanographers do not know how many there are--is near the westernmost extent of the eastern Pacific sea-floor-spreading anomalies. It appears to be either a series of angular fractures or a single northwest-trending structure. (See map on following page.)



Topography of North Pacific sea bottom where oceanographers aboard the U.S. Coast & Geodetic Survey Ship Surveyor recently conducted studies aimed at determining the history of this vast underwater region. Question marks at various fracture zones indicate their extent has not yet been determined.

Foreign Fishing Off U.S. in April

NORTHWEST ATLANTIC

April's good weather allowed uninterrupted surveillance from south of Nova Scotia to Cape Hatteras, N. Carolina; 237 vessels were sighted. In March 1969, there were 218.

Most were Soviet--30 factory stern trawlers, 131 medium side trawlers, 6 factory base ships, 4 refrigerated transports, 1 tug, and 1 tanker. (In April 1968, 188 had been sighted.)

Off Southern New England & Georges Bank

Soviet: Since January 1969, 15-20 stern trawlers had fished (mostly red hake) south of Block Island towards Nantucket. After moving off the Virginia Capes for a short time, they shifted early in April to the vicinity of Hudson Canyon. No catches were observed.

By mid-month, 25-30 side trawlers were south of Martha's Vineyard and Nantucket. Catches were mostly herring. Earlier, some of these trawlers had fished off Virginia and North Carolina.

Many Soviet vessels were sighted on Georges Bank in late April for the first time in 1969. From 20 to 25 stern trawlers fished in 75-100 fathoms along the eastern slopes, between Lydonia and Corsair Canyons. No catches were observed. (At that depth they may have been seeking whiting.)

Off Mid-Atlantic States

Soviet: Over 100 vessels fished off the mid-Atlantic coast throughout the month. This fleet showed surprising mobility: it shifted north and south several times in one week. At end of March, it was off the entrance to Chesapeake Bay. During first week in April, it shifted north off Delaware Bay, returned off Chesapeake entrance, and finally moved south off North Carolina.

On April 9 and 10, 107 medium side trawlers and 7 support vessels were in a 25-mile area, about 25-30 miles east of Currituck Sound, N.C. Moderate catches were mostly herring. A few vessels were scattered north of the fleet. On the same dates, 15 vessels (mostly stern trawlers) were in 2 groups, 30 miles south of Long Island and 60 miles east of New Jersey. No catches were observed.

By mid-month, an estimated 100 vessels (mostly side trawlers) had concentrated in a 15-mile area, 50 to 60 miles southeast of Cape May, N.J. A small group was south of Moriches, L.I. Catches were mostly herring. (In April 1968, 75-100 vessels had fished herring 40-60 miles south of Moriches.)

From the third week, the main concentration was in a 20-mile area, 65 miles south of Shinnecock, Long Island (north of Hudson Canyon). Heavy to moderate catches of herring were observed. A group of 25 vessels was widely scattered from east of Atlantic City to southeast of Cape May. Several stern trawlers had catches of red hake on deck.

Polish: Two factory stern trawlers, 28 large side trawlers, and 2 factory base ships were sighted.

Before mid-month, 20 to 25 vessels were 40 miles east to 60 miles southeast of Cape May. Moderate catches were mostly herring and some mackerel. After mid-month, about 25 dispersed off New Jersey, east of Barnegat Lightship to southeast of Cape May. Catches were mostly herring. (In April 1968, 25-30 vessels had fished off New York and New Jersey.)

Japanese: Ten stern trawlers were sighted, the largest number ever observed fishing off the U.S. Atlantic coast. They operated along the 50-100 fathom edge, from south of Martha's Vineyard to the southwest slopes of Georges Bank. Catches appeared to be whiting. All vessels had hydrophones hung from booms on the port side. Hydrophones are part of a recording system indicating trawl behavior (depth, etc.).

Spanish: Twenty pair trawlers fished from the Northeast Peak of Georges Bank to Brown Bank. Several had fair catches of cod on deck.

East German: Late in April, 2 side trawlers were 60 miles south of Martha's Vineyard. No catches were observed. (In April 1968, 3 side trawlers had fished herring 17-20 miles south of Shinnecock Inlet, L.I.)

U.S.-USSR Mid-Atlantic
Fisheries Agreement

The 'no fishing zone' restrictions ended on April 1. No Soviet support activities were observed in the loading zones.

On April 11, a 6-man U.S. team visited the Soviet Fishing Fleet Commander aboard the 'Robert Eihe,' about 50 miles off Norfolk, Va.

Polish Vessel Enters Port

On April 12, the Polish factory base ship 'Pomorze' entered the port of Philadelphia, Pa., to take on fresh water and small amounts of food and fuel. She had only a small cargo of frozen and bulk salted herring on board.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign vessels were reported fishing in April 1969.

OFF CALIFORNIA

Soviet: Four side trawlers, 14 stern trawlers, and 3 support vessels fished west of San Francisco, stretching 80 miles north and south. Pacific hake, rockfish, red snapper and black snapper catches were observed. (About the same number had fished here in April 1968. Many were the same.)

OFF PACIFIC NORTHWEST

Soviet: Seven stern trawlers, 13 side trawlers, and 5 support vessels were sighted. Except for 1 support vessel, all were off Oregon. (In April 1968, 54 Soviet fishing vessels had been sighted.)

After mid-April, 1 stern trawler was observed with her deck bins filled with Pacific hake. Towards the end of the month, side trawlers took large quantities of hake. Some, fishing in pairs, landed an estimated 40,000 to 50,000 pounds for each tow. Individual side trawlers tows were estimated at 20,000 to 30,000 pounds.

Japanese: One longliner was sighted off Oregon. On one occasion, the catch observed was almost entirely black cod, with a few red snappers. (One stern trawler and 1 support vessel had been in the vicinity in 1968.)

OFF ALASKA

Soviet: The 165 vessels sighted at end of March dropped to 82 by end of April. In April 1968, 70 had been sighted. This year's increase is largely attributable to a second shrimp fishing fleet in the Gulf of Alaska--and to a continued herring and flounder fishery in eastern and central Bering Sea.

The decline in vessels fishing flounder began in early April but, unlike previous years, withdrawals halted in mid-month. About 15 medium trawlers and 5 support vessels remained along the Continental Shelf edge south of the Pribilofs, a favored Alaska pollock fishing area. Sightings indicated that fishing had shifted from flounder to pollock.

Herring fishing was sporadic. At month's end, only 5 medium trawlers and 1 processing refrigerator remained, north and west of the Pribilofs, in central Bering Sea.

The deep-water trawl groundfish fishery, along the Shelf edge in eastern Bering Sea, was abandoned in early April. The vessels transferred to the shrimp fishery in the Gulf. Late in the month, 2 medium trawlers resumed the groundfish fishery along the Shelf edge, west of the Pribilofs.

Two factoryships and 8 tangle net-setting trawlers fished crab north of the Alaska Peninsula. This year, as in 1968, most Soviet catches were tanner rather than king crab.

Fig. 1 - 'Pavel Chebotnyagin,' factory ship, receives picker boats with loads of tanner crab.

One shrimp fishing fleet--15 medium trawlers and 2 factoryships--remained on Portlock Bank, east of Kodiak Island. In early April, a second shrimp fleet--1 canning

Fig. 2 - Factory ship 'V. Putintsev,' nested with refrigerated transport 'Visili Perov,' and SRTM 8-407 alongside, on shrimp grounds. (Photos: Branson)

factoryship and 6 medium trawlers--began fishing near the Shumagins, in the western Gulf. This was the first time the Soviets had fished shrimp near the Shumagins since the U.S. contiguous fishery zone was effected in March 1967.

Japanese: Fishing effort--125 to 130 vessels--remained relatively stable.

About 5 stern trawlers fished ocean perch along the Shelf edge, principally in the eastern Gulf. This was the only known Japanese ocean perch fishery in the Alaska region.

Ten stern trawlers, 2 medium trawlers, and 1 refrigerated transport fished herring in central Bering Sea during first 2 weeks of April. Then, much like the Soviets, the Japanese reduced effort, and withdrew from the fishery during the third week.

About 4 stern trawlers fishing groundfish along the Shelf edge, in eastern and central Bering Sea, had increased to 10 and 1 refrigerated transport by month's end. The additional vessels had come from the abandoned herring fishery. Catches, mostly pollock, included small amounts of sablefish, arrowtooth flounder, and ocean perch.

Three minced meat and meal factoryship fleets remained along the Shelf edge, north of the Fox Islands in the eastern Aleutinas, through mid-month. In late April, they moved north onto the Shelf, northeast of Unimak Is. At month's end, a fourth fleet of about 15 vessels was nearing the eastern Bering Sea fishing grounds.

Two factoryships, with 30 tangle-net and pot-fishing trawlers, fished tanner and king crab north of the Alaska Peninsula. As before, Japanese crab vessels often mingled with their Soviet counterparts.

Three to 5 longliners fished sablefish in the Gulf off southeastern Alaska. In late April, 2 longliners were north of Fox Is. in eastern Aleutians. A third was along the Shelf edge west of Pribilofs. Eastern Bering Sea catches appeared to be sablefish.

South Korean: One stern trawler fished along the Shelf edge in the eastern Bering Sea, from west of the Pribilofs to near Unimak Pass. This same trawler made at least 2 trips to the eastern Bering Sea last year.

STATES

New York

REEF FISH STUDY BEGINS THIS SUMMER

During summer 1969, the New York State Conservation Department will start an extensive, long-range study of the fish populations of artificial reefs. The Department says little is known of these fish in northern waters. It is seeking information on kinds of reef fishes and their life stages spent there. This information is necessary to manage these fishery resources properly.

Reefs Selected

The reefs selected are the inshore reef in Great South Bay near Saltaire and the offshore reef near Fire Island Inlet. Sampling locations will be marked with red and white marker buoys.

The Study

The study will include general life history, movement, and population of sea bass and blackfish (tautog). Both will be tagged either with red and white Petersen Disk tags, or a new type of colored plastic streamer.

There will be a $1 reward for returning a tag. The public is asked to send both disks, if that type is used, or entire plastic streamer with where, how, and date fish was caught to: New York State Conservation Department, Setauket, New York 11785.

* * *

WATER-POLLUTION RESEARCH CENTER SET UP BY 9 COLLEGES

Nine colleges and universities in the New York metropolitan area are working together to organize an oceanographic research center at Montauk, the easternmost tip of Long Island. The center will seek solutions to pollution problems in the waters around Long Island. The 9 institutions have leased the buildings formerly housing the testing facilities of the Republic Aviation Corp. These will be converted to marine laboratories this summer.

The 9 are Adelphi, Dowling, Fordhar Hofstra, L. I., N. Y. Institute of Technology, New York University, St. John's, and the State University of N. Y. The new center also will coordinate the marine research now being done independently by the 9 schools.

Isolate Pollutants First

Dr. James Alexander, acting director, said the first research project would be to isolate the compounds polluting Long Island waters. He added: "Pollution is Long Island's main problem. Our aim will be to find out how the ecology has been affected."

Visiting professors and graduate students will study first pollution's effects on such microorganisms as plankton.

Alaska

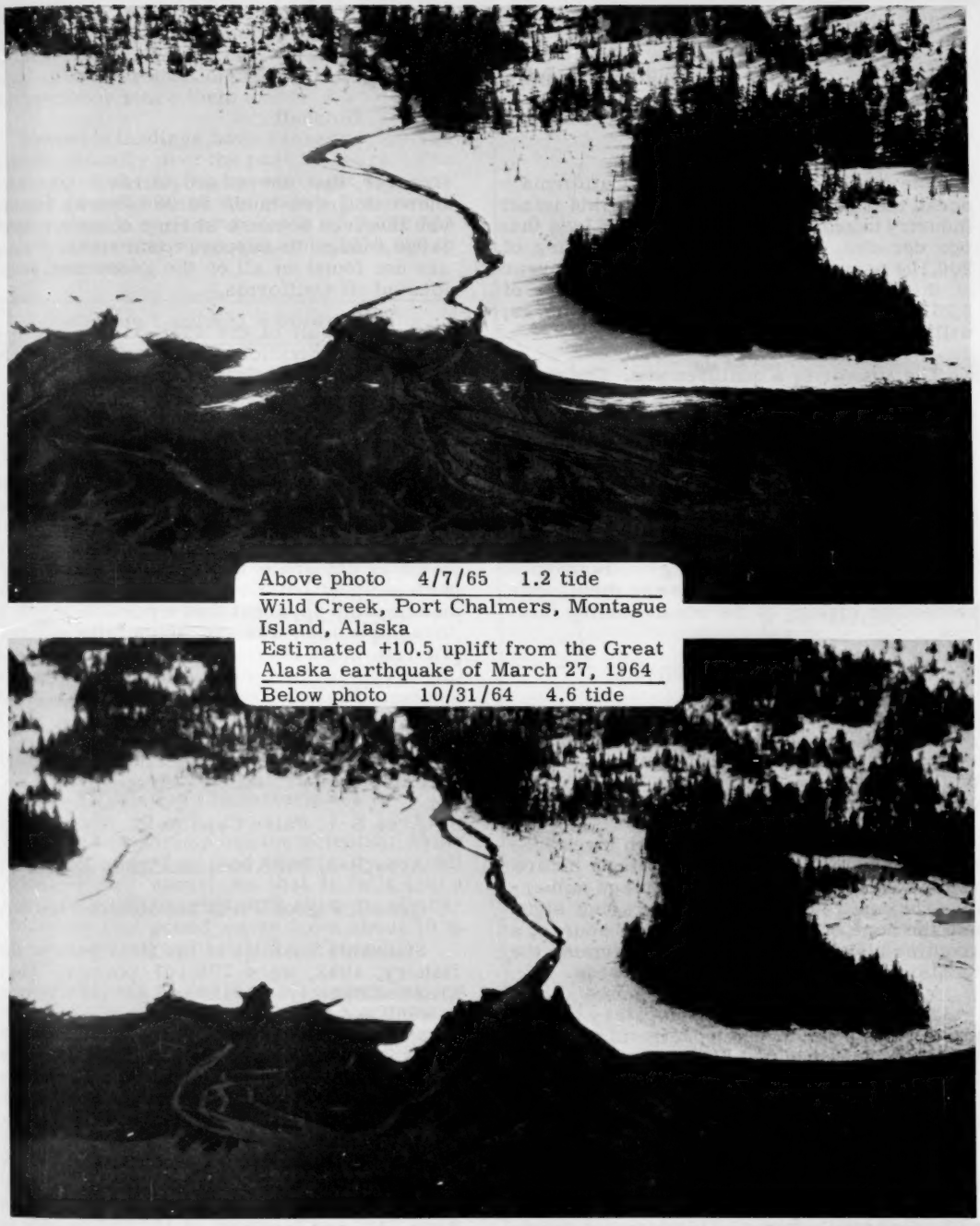
SEEKS U.S. FUNDS FOR EARTHQUAKE-CAUSED SALMON DISASTER

The Prince William Sound salmon fishery suffered a disastrous decline as a result of the March 1964 earthquake. The earthquake centered in this area. Land mass subsidence in parts of Prince William Sound caused loss of spawning grounds. These are covered with salt water. In other areas, the land mass was uplifted. This caused instability and erosion of spawning beds. The result is a substantial decline of salmon runs throughout Prince William Sound.

Montague Island Hard Hit

The situation is particularly serious on Montague Island. The island was tilted upward 8 feet at its northeast end and 35 feet at the southwest. Before the earthquake, Montague Island salmon runs were about 700,000 each year; only 20,000 are expected for 1969.

The Alaska Department of Fish and Game has requested the Secretary of the Interior to find the Prince William Sound salmon fishery a fishery disaster under Public Law 88-309. The finding would permit 100% Federal funding for fishery restoration projects. State and Federal personnel are cooperating to prepare a proposal for rehabilitation and restocking of certain Montague Island streams.



Above photo 4/7/65 1.2 tide

Wild Creek, Port Chalmers, Montague Island, Alaska
Estimated +10.5 uplift from the Great Alaska earthquake of March 27, 1964

Below photo 10/31/64 4.6 tide

Aerial photographs showing overwinter changes in the channel of Wild Creek which illustrate extreme instability following the Alaska earthquake. Most streams in Prince William Sound in areas uplifted 6 feet or more displayed similar action. (Photos: Jerre Olson)

California

Will The Shrimp Boats Keep A Comin'?

W. A. Dahlstrom and D. W. Gotshall

The quota system applied to California's ocean shrimp fishery has enabled this infant industry to grow to lusty maturity in less than two decades. From a modest beginning of 206,107 pounds landed in 1952, the first year of the fishery, landings hit a new high of 2,272,545 pounds in 1968. The question is, will it always be that way?

The answer is a qualified yes. The ocean shrimp fishery can prove stable and profitable for many years to come, with one provision. The quota system must be strictly adhered to, or the fishery could disappear in a single season.

Two other questions might be, "How and why are quotas set," and "Why is this fishery so susceptible to overfishing?" Both good questions, but before we answer them, let's review the history of the ocean shrimp fishery.

California Ocean Shrimp

Prior to 1952, it was a latent, unutilized resource. The groundwork for utilizing this resource was carried on by marine biologists of the California Department of Fish and Game.

During some of the bottom fish investigations conducted by the Department before 1950, occasional net hauls contained numerous shrimp. With these encouraging signs and the hope of developing a new resource, a scouting plan was designed to determine the location and extent of our shrimp beds.

During 1950 and 1951, exploratory fishing was conducted from the Department research vessel 'N.B. Scofield'. Tows were made over the areas where shrimp had been found and over areas where the bottom and depth appeared suitable for shrimp.

From exploratory fishing and data received from commercial fishermen, we learned that ocean shrimp are always found in association with green mud bottoms. This does not mean, however, that there are shrimp wherever there is green mud. Some unknown factors are involved because shrimp concentrations large enough to support commercial fishing are not found on all of the green mud areas located off California.

As a result of the 1950-51 search, five dense concentrations of ocean shrimp were charted along the California coast.

Areas Established

In 1951 the California State Legislature enacted laws empowering the Fish and Game Commission to regulate the new ocean shrimp fishery. The area of the shrimp beds and the abundance of shrimp on them were used as a basis to designate three fishing areas, each with a specified limit or quota. By 1956 it had become apparent that a portion of one of these areas (B) was not being fully utilized. Therefore it was divided and the two shrimping areas formed were allotted separate quotas. The four designated shrimping areas along the California coast are:

Area A, from the Oregon-California border to False Cape;

Area B-1, False Cape to Pt. Arena;

Area B-2, Pt. Arena to Pigeon Pt.;

Area C, Pigeon Pt. to the Mexican border.

Statewide landings in the first year of the fishery, 1952, were 206,107 pounds. They climbed steadily to peaks of 2,006,274 pounds in 1960 and 2,095,278 pounds in 1963. Landings fluctuated between 980,608 pounds and 1,425,875 pounds from 1964 to 1967 because of lower shrimp abundance, reduced quotas in Area "A", and little or no harvest from Areas "B-1", "B-2", and "C".

The all time high of 2,272,545 pounds landed in 1968 was made possible because of shrimp abundance, an increased quota in Area "A", and landings of 191,925 pounds in

The authors are Marine Biologists, California Department of Fish and Game.
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Area "B-2". After initial landings of about 200,000 pounds each year during 1952 and 1953 in Area "C", Area "A" became the principal area of production and has remained the top producer since then.

Statewide landings have average 1,699,734 pounds annually over the past 10 years. The 10 years of shrimping have brought approximately $1,800,000 to the state's fishermen. Last season's record catch of 2,272,545 pounds was worth approximately $270,000 to the fishermen.

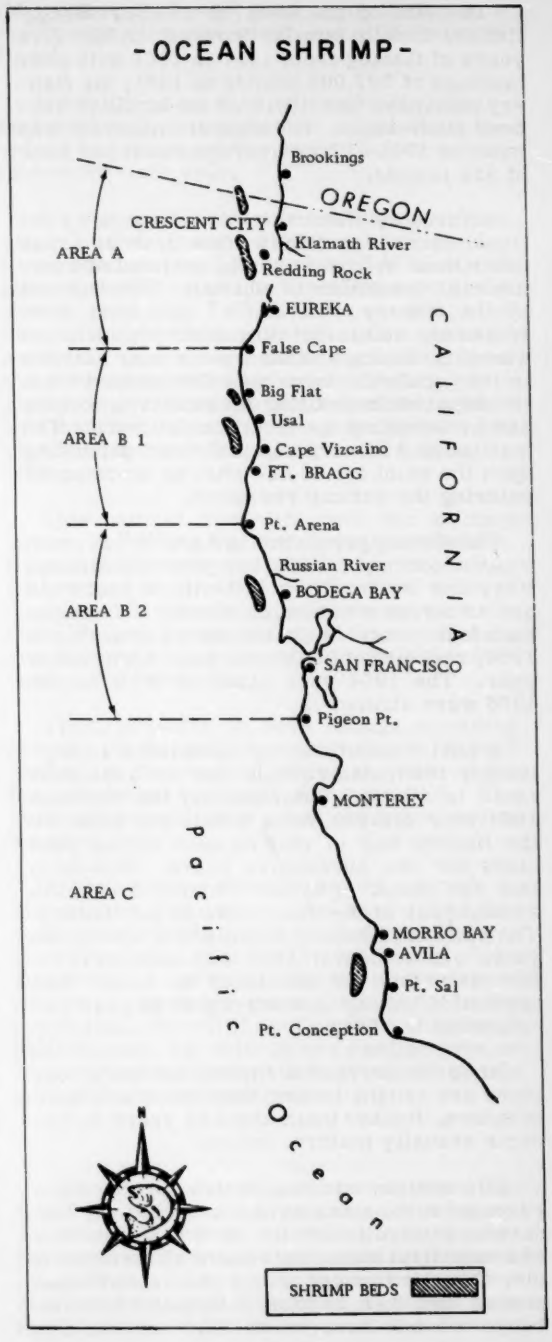
Statewide Landings - Ocean Shrimp

Year	Pounds Landed
1952	206,107
1953	295,524
1954	299,768
1955	847,062
1956	1,170,074
1957	1,425,631
1958	1,730,222
1959	1,785,228
1960	2,026,787
1961	2,006,274
1962	1,786,289
1963	2,095,278
1964	980,608
1965	1,425,875
1966	1,213,959
1967	1,404,821
1968	2,272,545

Population Characteristics

The ocean shrimp has the scientific name of Pandalus jordani and is actually a small prawn--small enough so that it falls into a size commonly marketed as shrimp. Heads-on counts per pound range from about 70 to 160, and average about 100 per pound.

Shrimp beds do not have stable populations as evidenced by the failure of the fisheries in Area "B-1", "B-2", and "C". Landings in Area "C" (Morro Bay) have virtually ceased since 1953 because the fishermen have not been able to find the shrimp in commercial quantity. The fishery in Area "B-2" (Bodega Bay) also declined after six years of fishing from 1953 to 1958. Landings have been sporadic and some years fishermen are unable to find the shrimp in commercial quantity.



The fate of the Area "B-1" (Fort Bragg) fishery took a similar course. After five years of fishing from 1957 to 1961 with peak landings of 797,000 pounds in 1961, the fishery collapsed and little or no landings have been made since. The highest catch rate was made in 1961 with an average catch per hour of 952 pounds.

Efforts by fishermen and surveys by the Department from time to time in those areas other than "A" have usually not located commercial quantities of shrimp. The harvest by the fishery in Area "A" may have been relatively stable but the shrimp population was not. Strong and also weak year classes in the population have been determined from the data obtained during the research cruises and by sampling the commercial catch. The population will surge up and down depending upon the numbers of new shrimp or recruits entering the shrimp resource.

The shrimp population in Area "A" is composed mostly of one and two year old shrimp. Very few shrimp live to be three years old and as far as we know, no shrimp live longer than four years in California waters. Since 1964, recruitment has been good every other year. The 1964 year class as well as the 1966 were strong.

A post-season survey completed in September 1968, also reveals that the 1968 year class is strong. Unfortunately the 1965 and 1967 year classes were relatively weak, so the fishery had to rely on each strong year class for two successive years. However, this did result in larger shrimp during the second year of the year class in the fishery. The pattern of strong recruitment every two years was evident in 1959 and also in 1961. However, this did not occur in 1963. The population swung into strong even year recruitment in 1964.

Since the harvested shrimp are so young, many are caught before they have a chance to spawn. It takes them about $1\frac{1}{2}$ years to become sexually mature.

Life history studies of this species have revealed some amazing characteristics. The normal pattern is for the shrimp to function as a male first when between one and two years old, then go through several transitional phases and then become a female when between two and three years old.

During strong recruitment years, however, it has been observed that many shrimp, as high as 70 percent of a year class, will start changing sex to females between one and two years old and will not function as males. This occurred in 1967 and resulted in a strong 1968 year class.

Range

The range of this species is from Unalaska to San Diego. They appear to have a maximum density off central Oregon. Area "A" is the California bed closest to the area of maximum density. Our other shrimping areas are further away and never have had the potential of Area "A". Initial surveys of the areas in 1950 and 1951 revealed a much larger population in Area "A" than in either Areas "B" or "C". Therefore, the original quotas were set at 1,500,000 pounds in Area "A", 400,000 in Area "B", and 200,000 pounds in Area "C". The Area "B" resource comprised one bed off Bodega Bay and one off Ft. Bragg.

We believe that it is not possible to have stable populations in Areas "B-1", "B-2" and "C" because of the fact that species on the extremities of their range are known to fluctuate widely and our observations indicate that the populations have been relatively small and do not have large potential. Even in the absence of fishing or with limited fishing, the resource has not returned to its former level of abundance in these areas.

Natural mortality is high and probably a good portion of this is caused by predator fishes. Fishing no doubt contributed its share to upset the delicate balance between recruitment and mortality and send the populations down to low abundance levels. Although shrimp still remained in the areas, the populations were reduced to a point where it became uneconomical to catch them.

The populations in these areas remain at a low level and only in Area "B-2" does the population occasionally make a slight comeback. Usually this is because a new year class enters the population but its potential is limited and provides only a fishery of about one season's duration. This occurred in 1962, 1963, 1965, and 1968 when landings ranging from 180,000 to 250,000 pounds were made.

Estimating Population

How do we determine the number and pounds of shrimp on a particular bed? Since 1960 we have used our research vessels, the 'N. B. Scofield' and 'Alaska', to survey the beds. Two surveys were made each year, one prior to the opening of the season and the second in the fall after fishing had ceased. Until 1965, a shrimp net was towed in areas where shrimp were concentrated and also outside of the concentrations to determine total area and abundance.

In 1965 we changed our survey methods in an attempt to improve our estimates. Area "A" was selected for a three-year intensified study.

First we compiled all information from fishermen's records and our research cruises to determine the area where concentrations of shrimp had been found since 1951. The resulting survey area, covering 270 square miles, was divided into sub-areas based on where shrimp concentrations tended to be more uniform through the years.

Next, our statisticians were given the task of setting up a random survey plan that would yield reliable estimates from the limited number of days that the research vessel was available.

The sampling system which was designed by these specialists involved several complex statistical formulas and the use of computers to calculate the estimates. We have used this survey plan since March 1965 in Area "A".

During the last four years, marine biologists have spent 205 days at sea and have made 1,188 tows. After a survey was complete, the data was fed into a computer, which in turn calculated the average number of shrimp per tow. A calculation was then made to determine how many possible tows $\frac{1}{2}$ mile in length could be made in the survey area. The total estimated population was then calculated by multiplying the average number of shrimp per tow by the total number of possible tows.

Mortality Rates

One of the most important facts we need to know about any fish population is the mortality rate. The end product of all our research, no matter what species, is to be able to predict the optimum harvest that a population of a marine species can yield and still maintain itself.

Mortality rates play an extremely important role in the complicated calculations involved in arriving at how many shrimp can be harvested each year.

All shrimp die either from fishing or from natural causes, such as being eaten by predators. We use population estimates to calculate mortality rates. In simplest terms, the annual mortality rate is the percentage of shrimp that die during the year. We can separate the percentage killed by fishing from the percentage killed by natural factors, simply by determining the percent of the population that dies naturally during the season and also during the winter, when no fishing is taking place.

This natural mortality rate for shrimp varies depending on the age of the shrimp. During their first year of life, approximately 67 percent of the shrimp die from natural causes; about 50 percent of the survivors die from these causes during the second year, and at least 75 percent of the population dies during the third year.

Thus, in order to have enough spawning shrimp in the fall, we must leave enough shrimp at the end of fishing to make up for the numbers that will die naturally. The earlier the quota is reached, the more shrimp we need.

Let's consider the effects of predators on the shrimp population. We have found that Pacific hake feed heavily on shrimp. We have also found that if we examine enough hake stomachs we can determine the percentage of one, two, and three year old shrimp in the population. To put it another way, it appears that we may be able to use Pacific hake as "finny" marine biologists to help collect data on the shrimp population.

Quotas

The bag limit or quota on a particular fishery is designed to provide a continuing and safe level of harvest. In other words, the Department of Fish and Game shrimp research program has been trying to prevent a "boom and bust" fishery. The boom and bust fishery is best exemplified by the sardine fishery.

Each California shrimp bed has a separate quota. The quotas from 1952 through 1960 were based on harvesting 25 per cent of the estimated population. Landings and catch rate per hour were also used as guidelines. Areas "B-1", "B-2", and "C" have had a minimum quota of 250,000 pounds since the year each Area failed.

A decline in the northern California shrimp population (Area "A") in 1964 prompted Department biologists to examine other methods for setting the quota for that area. The biologists found that there seemed to be a relationship between the number of females left at the end of the commercial fishery in the fall and the number of one year old shrimp produced by these females.

In 1965 the quota for Area "A" was set to allow a minimum of 300,000,000 females to survive and spawn. These females produced an estimated 1,800,000,000 one year old shrimp, or six young shrimp for every spawning female. In the fall of 1966 a spawning population of 150,000,000 females produced approximately 400 million one year old shrimp, or slightly less than a 3 to 1 increase.

The one year olds produced by the 300 million females supported the fishery during 1967 and 1968; in fact the 1968 California catch was the largest ever landed from Area A.

Thus we learned that we had to leave a sufficient spawning stock for continued reproduction.

The quota for Area "A" is determined during the winter, following a fall research cruise. From the cruise data, the biologist in charge at Eureka determines the number of shrimp that will be on the bed when the season opens the following spring, and then calculates how many pounds of shrimp can be harvested and still leave enough females for spawning in the fall. The fall population estimate and our calculated mortality rates are used to make these predictions.

The recommendations are sent through staff to the Director. After review, the Director makes a recommendation to the Fish and Game Commission which in turn establishes a quota, during a public meeting, for the coming season. At this time shrimp fishermen and processors have an opportunity to make their own recommendations to the commission concerning the quota.

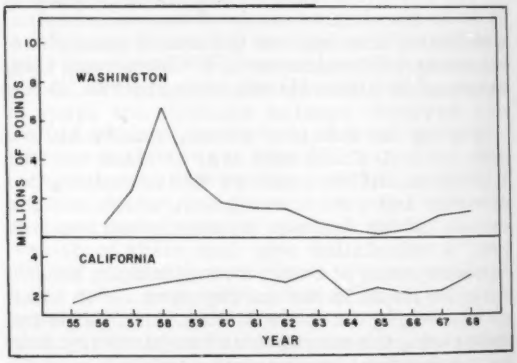
Why Conservative

When quotas were originally established in 1952, it was realized that the areas had limited potential. These quotas based on one-fourth of the total population would serve as a stepping stone to increase or decrease the quotas depending upon the change of abundance of the shrimp in each area.

Initially the small quotas were attained and shortly thereafter the fisheries declined. Area "A", however, has continued on a sustained yield basis since inception of the fishery in 1952.

If overfishing takes place in this area, we believe events will follow the pattern of the other areas in California and that an industry based on shrimp in California will be virtually non-existent. The backbone of the California shrimp landings has been the Area "A" bed and we believe that through the flexible use of a quota system the resource has been able to sustain itself.

A good example of the tragic consequences of overfishing can be provided by what happened in the State of Washington. With unrestricted fishing, landings peaked at 6.4 million pounds in two years (1968). Since then, there has been a steady decline in effort and landings, and during 1964, 1965, and 1966, virtually nothing was landed.



Apparently this same thing happened within California's Area "B" and "C" beds. Area C off Morro Bay peaked during 1953 with landings of 200,000 pounds. In 1954 less than 10,000 pounds were landed. Peak landings occurred during 1957, 1963, 1965 in Area B-2. In 1961, 800,000 pounds were landed from Area B-1; the following season saw landings drop off to 250 pounds.

Importance of Fishery

What would happen to the economy of the north coast regions of Eureka and Crescent City if the Area "A" shrimp bed failed? The first noticeable effect would be reduced summer employment. Shrimp processing in Eureka and Crescent City now employs between 400 and 500 persons each summer. A large number of these workers are high school students. In many cases this is the only employment open to these students.

The economic value to the 30 to 45 fishermen who participate in the fishery must also be considered. These fishermen have received an average of $180,000 annually for the past 10 years. We estimate from the wholesale price of shrimp, that the Area "A" shrimp fishery in the past 10 years has contributed an average of $600,000 annually to the north coast economy.

Evidently the fishermen are prospering from the shrimp fishery and other fisheries they pursue during the year. Five new boats, 50 to 60 feet in length, have been built and have been or will be involved in the shrimp fishery.

Crescent City is in the process of building two new fish processing plants. The success of the companies that will operate these plants will depend in part upon the shrimp landings.

It would be tragic to see the shrimp industry fail because of lack of shrimp. The Monterey sardine industry remains as a powerful example of what can happen when an important fishery fails. Empty and abandoned canneries, rusting equipment, and large purse seiners slowly going to pieces from disuse are constant reminders of what can happen when an "inexhaustable" supply of fish suddenly vanishes.

Future

What about the future of the ocean shrimp resource? We are convinced that California can maintain a healthy fishery for future generations. The continued sustained yield of Area "A" since 1952 speaks for itself. The key to the future of California's ocean shrimp industry is in Area "A". Our statisticians have calculated that Area "A" can safely harvest 1.5 to 2.0 million pounds each year. In some years greater harvests may become possible.

Efforts will be made to work out a joint management plan with the State of Oregon for management of the Area "A" shrimp population because vessels operating out of Brookings, Oregon, also fish the same area and harvest from the same population.

For California to have a continued stable fishery, a quota system is necessary. The cooperation and understanding of the members of the Department of Fish and Game, the Fish and Game Commission and the members of shrimp industry are the essential ingredients. If this resource is properly managed, it can continue to produce savory shrimp cocktails and Louis for many years to come.

* * *

ANCHOVY LANDINGS FAR EXCEED LAST SEASON'S

California landings of anchovies for reduction were estimated at 27,246 tons for the 1968/69 season, the California Department of Fish and Game (DFG) reported May 24. The quota for the season that ended May 15 was 75,000 tons. Landings were much greater than the previous season's, when there was little fishing and the total was 6,505 tons.

In the Northern Permit Area, with a quota of 10,000 tons, landings were 2,736 tons. The 5 zones of the Southern Permit Area had landings of 24,510 tons. The bulk of landings--12,046 tons--were in offshore Zone V. Zone II, Point Hueneme to Point Vicente, and Zone III, Point Vicente to Dana Point, attained quotas of 5,000 tons before end of season and were closed.

Insufficient Plant Capacity

DFG said southern fleet remained active until season's end. But considerable time was lost because vessels were unable to unload for lack of sufficient plant holding and processing capacity. State, Federal, and university biologists have estimated the anchovy population in California waters at a minimum of 2 million tons.

Anchovies taken in the reduction fishery are processed into oil and fish meal for poultry and livestock feed, also used as bait and for canning.

Study Anchovy Population

DFG noted that anchovy population studies are continuing. During April, 10,000 anchovies were tagged in Ensenada; the total tagged now is 380,719. Tag recoveries for April were 55, and 42 in May; total recoveries are 965.

The latest tag recoveries bolster earlier data showing a strong north-to-south movement and an exchange of fish between major fishing areas in Southern and Central California.

Florida

GOV. KIRK SIGNS AQUACULTURE BILL

On June 4, Gov. Claude R. Kirk Jr. signed into law an aquaculture bill permitting the private leasing of waters overlying state-owned land. The act provides the legal structure for leasing the waters to develop domestic seafarming of oysters, shrimp, pompano, catfish, and other fresh and saltwater seafoods.

The governor said: "This bill provides for the creation of a good, clean industry which may very well become the most important in Florida and, indeed, the world. Florida has more coastal waters than any other state. With the advent of domestic seafarming under this bill, we may very well become the leader in feeding the starving peoples of the world. Within a period of 24 months more than $150 million will be invested in Florida aquaculture under this bill. Industry has hesitated coming in to Florida because we had no specific law. We had 42 companies expressing an interest in investing in aquaculture here, and now we expect them to move in."

Texas

ELECTRIC BROODER
FREES MALE CATFISH

Male channel catfish at the Texas Parks and Wildlife Department's San Marcos fish hatchery now have more leisure time. They don't have to "egg sit" anymore--the whole process has been automated.

Until now it has been the practice of male catfish to herd the female toward the nest, fertilize the eggs and then chase the female from the area since females are notoriously cannibalistic toward their offspring.

The male would then tend the eggs during the seven-day incubation period, fanning the nest with his tail to keep the water agitated and the silt off the eggs. State hatchery personnel have recently begun using a machine which will do this better than the catfish, since male catfish have been known to shuck the whole thing and leave the eggs unattended.

Now, almost immediately after the eggs are laid and fertilized, the male is driven from the nest and the eggs are removed. They are then placed in baskets which are in turn placed in a long trough where water is agitated by fans driven by an electric motor.

Harmon Henderson, hatchery superintendent for the Department, says survival rate in the hatching trough has been tremendous.

The first hatch of eggs from a single channel catfish numbered approximately 36,000, all of them quite active. (Reprinted from 'News' of Texas Parks & Wildlife Dept., 6/2/69.)

* * *

RESTOCK OYSTERS IN SAN ANTONIO BAY

The Texas Parks and Wildlife Department has completed restocking oysters in most of San Antonio Bay and part of Espirito Bay. The flooding caused by Hurricane Beulah in Sept. 1967 had virtually eliminated oysters from these bays.

Terry Leary, marine fisheries coordinator, reported that the Department has been trying to restock the area using disaster aid money from BCF--but heavy rains and resulting low salinities in the past two years prevented it.

Leary says a natural seeding has occurred in the lower part of San Antonio Bay. The result has been a very hardy oyster that appears capable of surviving in almost fresh waters.

Fresh Water In Shell

"Ordinarily, when an oyster comes in contact with fresh water, it literally 'clams up,'" Leary noted. "But we have opened some of these oysters up and found fresh water on the inside of the shell."

The Department did not want to go outside the San Antonio-Espirito Bay system and possibly bring in new oyster diseases. So it contracted with local oyster fishermen to dredge up 500 barrels of these oysters at Panther Point and transplant them on reefs in other parts of the bay.

Leary says the work will be completed just in time for spawning season. Since each oyster may release up to a million spat, the reefs now devoid of oysters will be repopulated in a short time.

RESEARCH ON A SYSTEM FOR BYPASSING JUVENILE SALMON & TROUT AROUND LOW-HEAD DAMS

Clifford W. Long and Richard F. Krcma

Young Pacific salmon (genus Oncorhynchus) and steelhead trout (Salmo gairdneri) from the upper Snake and Columbia Rivers must now pass through 6 to 9 low-head dams (such as Bonneville) on their journey to the sea. Although these dams are equipped with fish ladders to aid them when they return as adults, only recently have facilities for safe guarding them as juveniles begun to receive attention. Juvenile fish are subject to mortality from turbines and from predators immediately downstream from the dams.

BCF and the U.S. Army Corps of Engineers are now modifying existing facilities to protect juvenile fish. The method provides for diverting most of the fish that enter turbine intakes into a bypass. This report explains the nature of the modification, how it may protect fish, and the type of research needed to prove the adequacy of the system.

FISH-BYPASS SYSTEM AND ITS APPLICATIONS

Figure 1 is a cross section of the powerhouse at Ice Harbor Dam, cut through the center of a main turbine and intake. The proposed fish-bypass system would employ a self-cleaning traveling screen for intercepting fish in the intake and diverting them into a gatewell. Fish would pass from the gatewell, via a submerged port (fig. 2) to the ice sluice (fig. 3). The ice sluice, designed to carry ice and debris from the forebay around the dam, would also carry the fish safely to the tailrace. In more recently constructed dams, such as John Day, the ice sluice was not incorporated. Instead, the Corps of Engineers installed a special bypass to serve fish passage needs.

This fingerling-bypass system could be employed to protect young salmon and trout in one of two ways. The more costly application would be the use of traveling screens in every intake of every dam to guide fish around each dam. A less costly application would be to use the bypass system to capture all fish at the first (uppermost) dam reached by the fish and transport them by truck or barge around the rest of the dams. Under the latter plan, the fingerling-bypass system would incorporate a suitable trap in the ice sluice or fingerling bypass, which would collect the fish rather than let them pass into the tailrace.

Before the collection-and-transportation method can be adapted, we must demonstrate that fish transported around many miles of river can find their way back to their home streams. BCF has several transportation studies underway to provide an answer to this question.

Meanwhile, we can proceed with the development of the fingerling-bypass system with the understanding that, no matter which system is finally used, the basic fish-bypass system will apply.

RESEARCH REQUIRED

Verification of the adequacy of this fish-bypass system requires research on several aspects of its construction and use.

The traveling screen for guiding fish must be proved adequate, both biologically and mechanically. The device must be efficient

The authors are Fishery Biologists, BCF, Biological Laboratory, 2725 Montlake Boulevard East, Seattle, Wash. 98102.

U.S. DEPARTMENT OF THE INTERIOR
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Sep. No. 840

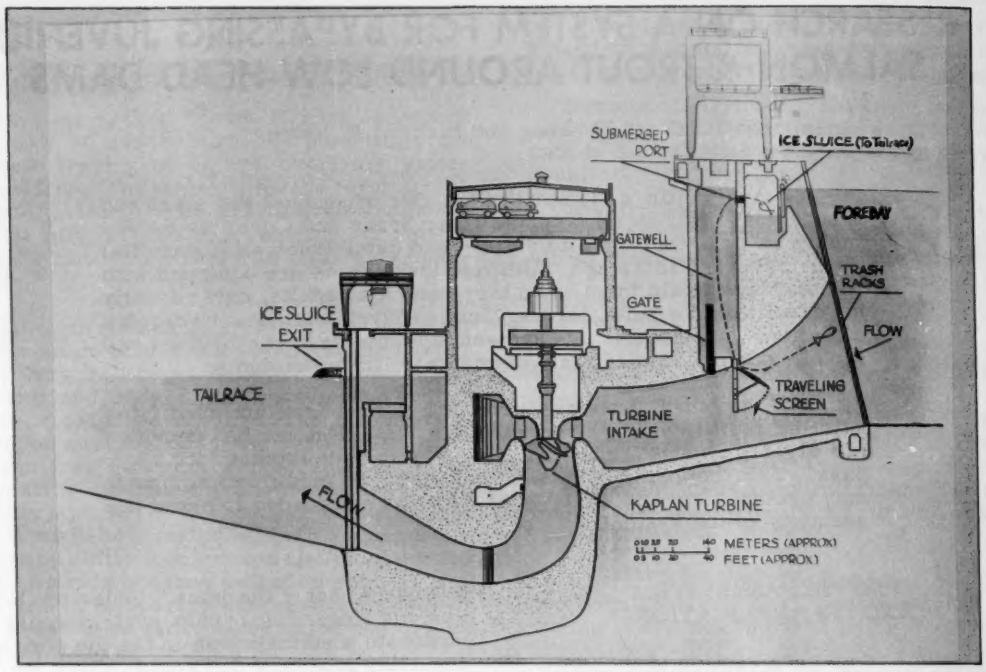


Fig. 1 - Proposed fish-bypass system for low-head dams would employ a traveling screen capable of diverting 70-80 percent of the young seagoing salmon and trout from intakes into gatewells. Fish would then pass through submerged ports to the ice sluice (or special bypass), where they could be collected for transport or allowed to pass on to the tailrace.

in diverting fish from intakes into gatewells. Small fish may impinge on the screen but will be carried by the screen up into the gatewell. Although present information suggests that brief periods of impingement will not harm the fish, additional work is required.

Laboratory studies will answer the question of impingement, but guiding efficiency can be determined only in turbine intakes. Hydraulic model studies, now being conducted for BCF by the Albrook Hydraulic Laboratory, Washington State University, can aid materially in describing the flows in the intake and gatewell created by the screen. From these studies, we can determine how to achieve hydraulic flow patterns that should produce maximum guiding efficiency and retention of guided fish in the gatewell.

Mechanically, we must demonstrate that the traveling screen: (1) is completely safe when placed immediately upstream from turbines (structural failure could cause damage to the turbine) and (2) can be operated for long periods without maintenance. Long-term tests in a large flume will be required.

Guided fish must pass readily through the submerged ports leading to the ice sluice. If the fish accumulate in the gatewell, alternative methods must be devised for more efficient passage. During tests on the latter half of the salmon run in 1968, research by BCF on 3 submerged ports (installed at McNary Dam by the Corps of Engineers) indicated that fish would pass through the ports with a minimum of delay. Further research will be carried out to measure rate of passage during the entire fish run--and to determine if the fish sustain injuries or mortality in passing through the ports.

Once fish are in the ice sluice, they must pass safely over a 36-ft. waterfall before they reach the tailrace downstream from the dam. Studies on survival in the ice sluice are required.

Finally, we must determine how bypassed fish should be released to minimize mortality from predation. Predators, such as northern squawfish (Ptychocheilus oregonensis) and seagulls, cause up to 33-percent loss of fish released in slack water below nonoverflow

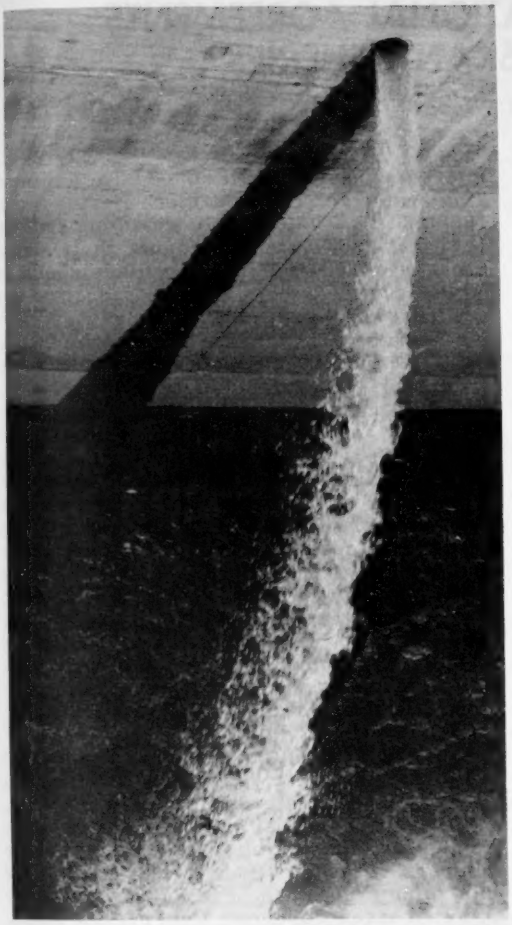


Fig. 2 - Experimental submerged port (6-inch diameter) installed at McNary Dam by the U.S. Army Corps of Engineers. It passes fingerlings from one of the 44 intake gatewells into the ice sluice for transport around the turbines.

sections of the dam. Future research must determine where fish should be released in the tailrace to minimize predation, whether predation is reduced when fish are released only at night, and whether the spilling of water through a spillway gate near the release site reduces predation. From these and similar studies, BCF and the Corps can develop a system that will provide juvenile migrating fish with best possible protection at minimum cost.

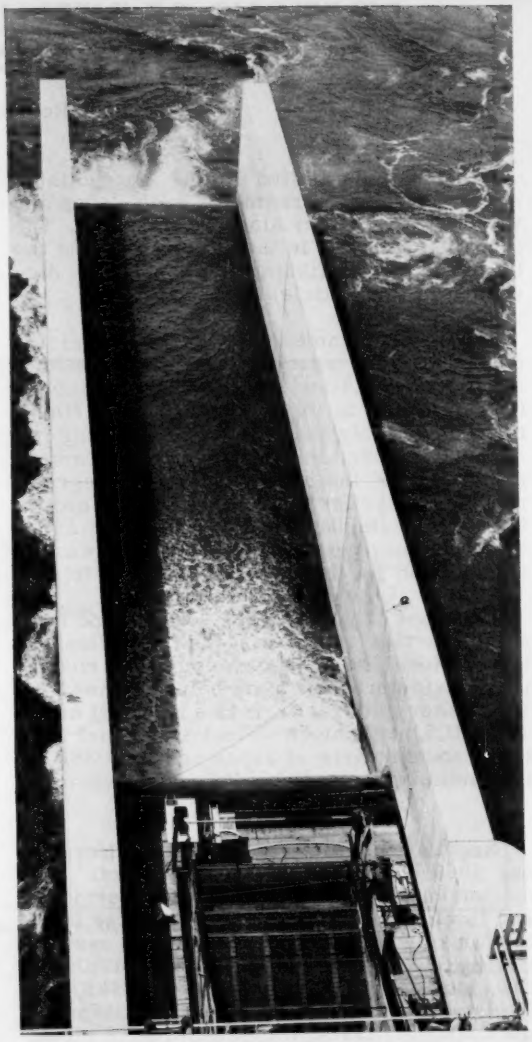


Fig. 3 - The ice sluice, used for transporting young fish around the turbines, discharges the fish in the tailrace about 120 feet downstream from McNary Dam.

The Corps of Engineers has provided BCF with funds to accelerate the development of this fish-bypass system. Moreover, the Corps already has equipped all 44 gatewells at McNary Dam with submerged ports. Research on these ports and on other aspects of bypassing fish are underway.

REVISIONS OF INTERNATIONAL AGREEMENTS AFFECTING ALASKAN FISHERIES

Ronald C. Naab

Recently the United States renegotiated several fishery agreements with Japan and the USSR that affect Alaska's fisheries. The principal changes in the agreements and the benefits to U.S. fishing interests are discussed in this article.

Alaska's commercial fisheries are: (1) dependent upon species that range the high seas far beyond waters of U.S. jurisdiction; (2) vulnerable to depletion by foreign fleets fishing on the high seas; and (3) receiving increasing protection through U.S. Government negotiation of international fisheries agreements. An earlier article1/ traced the evolution of the safeguards afforded Alaskan fisheries as they were faced with increasing competition by the growing foreign fleets.

Constant changes in the Alaskan and foreign fisheries require frequent revisions of international fisheries agreements to ensure that maximum benefits are being obtained for U.S. fishery interests. In late 1968 and early 1969, U.S. negotiators and advisors met with their counterparts of Japan and the USSR to reexamine several fisheries agreements.

Japanese Agreements

Negotiations with Japan began in November 1968 and extended over 3 weeks. The discussions centered around 2 agreements and involved the questions of Japanese fishing for king and tanner crabs in the eastern Bering Sea, fishing for groundfish within the U.S. contiguous fishery zone off Alaska, and fishing for groundfish in high-seas waters off the coasts of Alaska, Washington, and Oregon. The new arrangements came into effect in late December 1968 and extended the agreements, as modified, until January 1971.

King Crab Catch Quota Halved

Provisions of the modified Japanese agreements are more favorable to U.S. fishing interests than the earlier ones. The Japanese king crab catch in the eastern Bering Sea in 1969 and 1970 will be only about one-half the 1967 and 1968 catches because their annual quota was reduced from 163,000 cases to 85,000 cases. Such a drastic reduction was needed to conserve the declining eastern Bering Sea king crab stocks while enabling U.S. fishermen to expand in the area and increase their share of the biologically allowable harvest. In addition, the modified king crab agreement further facilitated U.S. fisheries by providing for an enlarged crab pot sanctuary north of Unimak Island, within which no tangle net fishing for king crab will be allowed (figure 1). As in the earlier version, the agreement does not prohibit the Japanese from fishing in the sanctuary with other types of gear for other species. But the Japanese Government, as a domestic, is prohibiting trawling in an extensive area in the eastern Bering Sea, including the pot sanctuary.

Annual Tanner Crab Catches Limited

In recent years, the Japanese began fishing for tanner crab largely as an incidental catch by their king crab fleets. During 1968, however, the Japanese greatly increased their fishing for tanner crab to the point where the numbers of tanner crab taken far exceeded their king crab catch. Prompted, in part, by this increased Japanese fishery, the U.S. in November 1968 published a list of Continental Shelf fishery resources considered under its sole jurisdiction. Included were tanner and king crab. The recent negotiations, therefore, were expanded to include also tanner crab. The Japanese have agreed to take measures to ensure a prudent catch of tanner crabs in the eastern Bering Sea. It was feared that uncontrolled Japanese fishing for tanner crab could quickly deplete the resource--as it was becoming increasingly needed for Alaskan fisheries.

Mr. Naab is with the Enforcement and Surveillance staff, BCF, Juneau, Alaska.
This article was directed toward fishermen and processors.
1/CFR, October 1968, pp. 46-56. Also Sep. No. 825.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 841

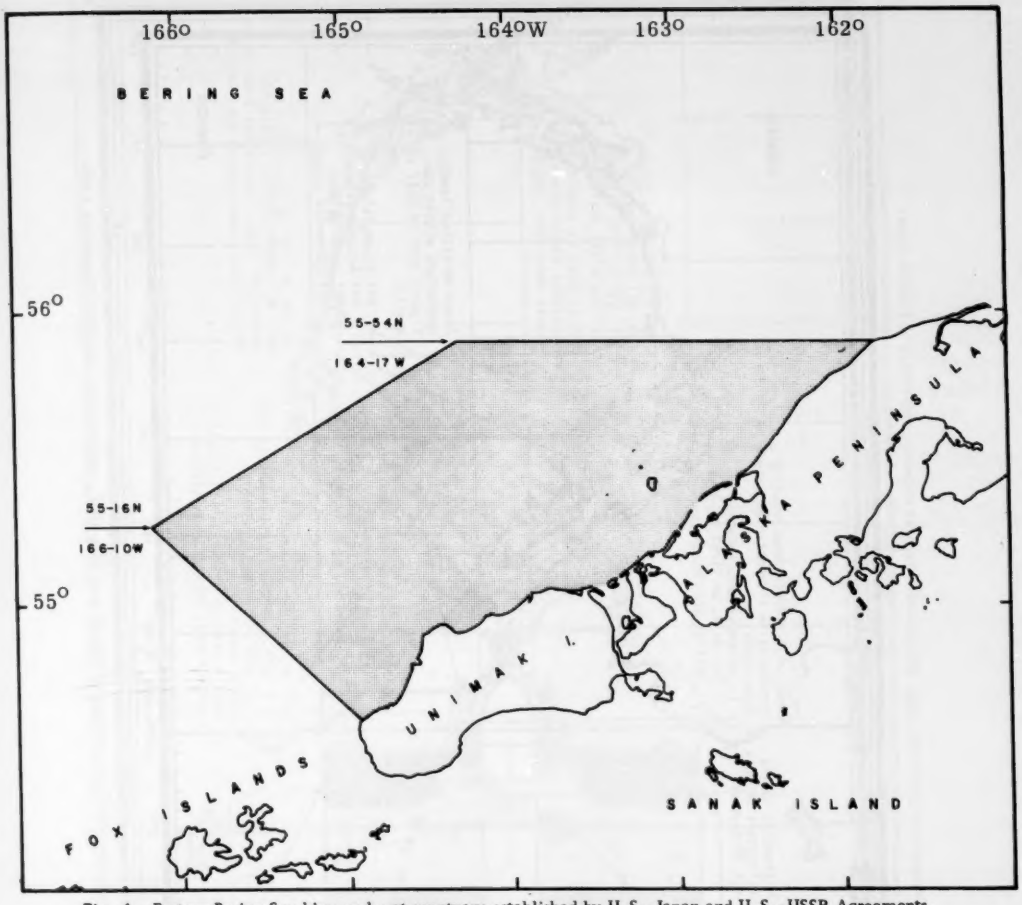


Fig. 1 - Eastern Bering Sea king crab pot sanctuary established by U.S.-Japan and U.S.-USSR Agreements.

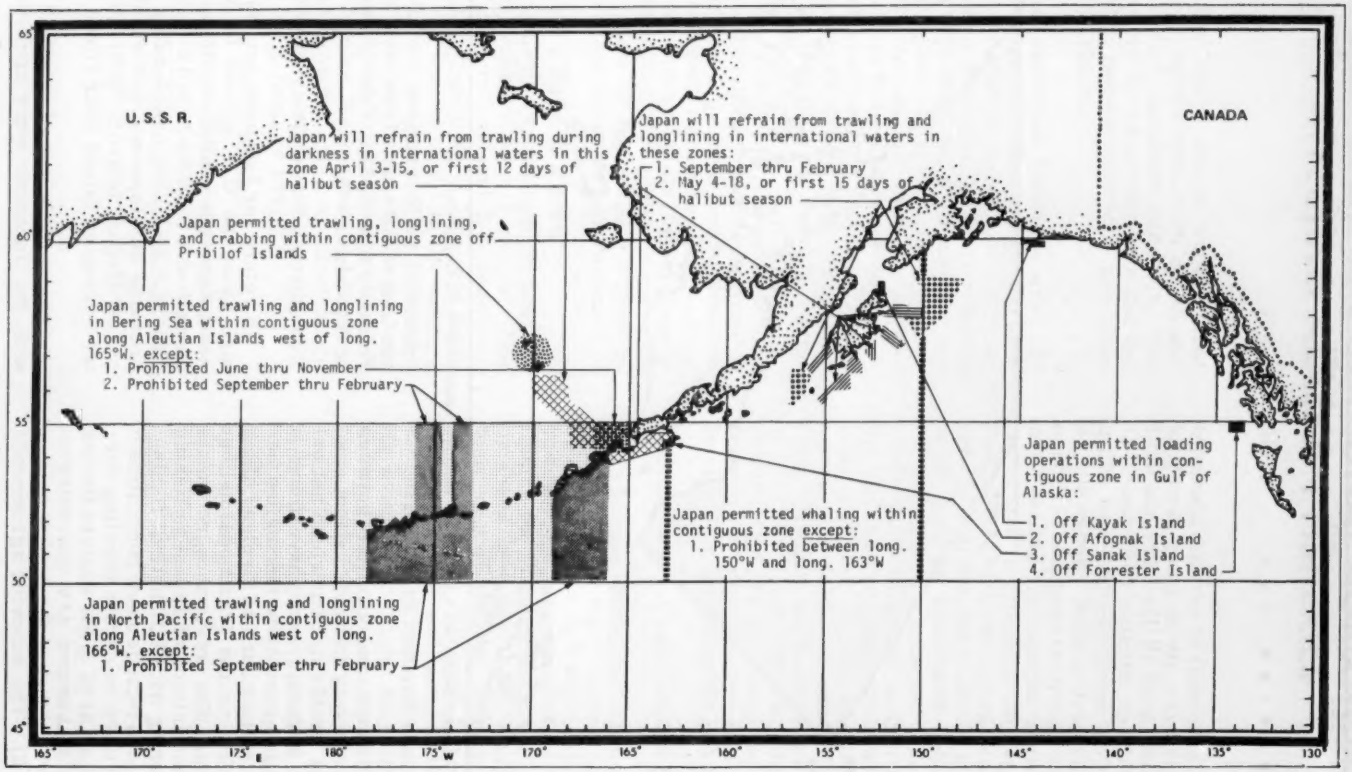
Halibut Fishermen Further Protected

Gear interference and conflict between foreign fishing vessels and U.S. halibut vessels has been a problem. American halibut fishermen, for several years, have found it difficult to fish in areas of the Bering Sea because of the large numbers of foreign fishing vessels operating on the traditional halibut fishing grounds. The revised agreements provide for restrictions of Japanese fishing to avoid interfering with U.S. halibut fishing. These restrictions include a new commitment by the Japanese to refrain from trawling during darkness in an area of the eastern Bering Sea where U.S. fishermen are concentrated during the short period of the spring halibut season (figure 2). The extended agreements continued the provisions for the 2 zones in the Gulf of Alaska, where the Japanese will refrain from fishing during the first weeks of the halibut season.

New Loading Zones Designated

In return for Japanese concessions on the high seas, the U.S. agreed to new areas in which Japanese vessels could conduct loading operations within the 3- to 12-mile contiguous fishery zone. Two new loading zones were provided the Japanese in the Gulf of Alaska: one off Afognak Island north of Kodiak, another off Forrester Island near Dixon Entrance.

Other provisions of the 1967 agreements with the Japanese were continued in force.


U.S.S.R.
CANADA
Japan will refrain from trawling during darkness in international waters in this zone April 3-15, or first 12 days of halibut season
Japan will refrain from trawling and longlining in international waters in these zones:
1. September thru February
2. May 4-18, or first 15 days of halibut season
Japan permitted trawling, longlining, and crabbing within contiguous zone off Pribilof Islands
Japan permitted trawling and longlining in Bering Sea within contiguous zone along Aleutian Islands west of long. 165°W. except:
1. Prohibited June thru November
2. Prohibited September thru February
Japan permitted loading operations within contiguous zone in Gulf of Alaska:
1. Off Kayak Island
2. Off Afognak Island
3. Off Sanak Island
4. Off Forrester Island
Japan permitted whaling within contiguous zone except:
1. Prohibited between long. 150°W and long. 163°W
Japan permitted trawling and longlining in North Pacific within contiguous zone along Aleutian Islands west of long. 166°W. except:
1. Prohibited September thru February
65°
60°
55°
50°
45°
165°
170°
175° E
180°
175° W
170°
165°
160°
155°
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140°
135°
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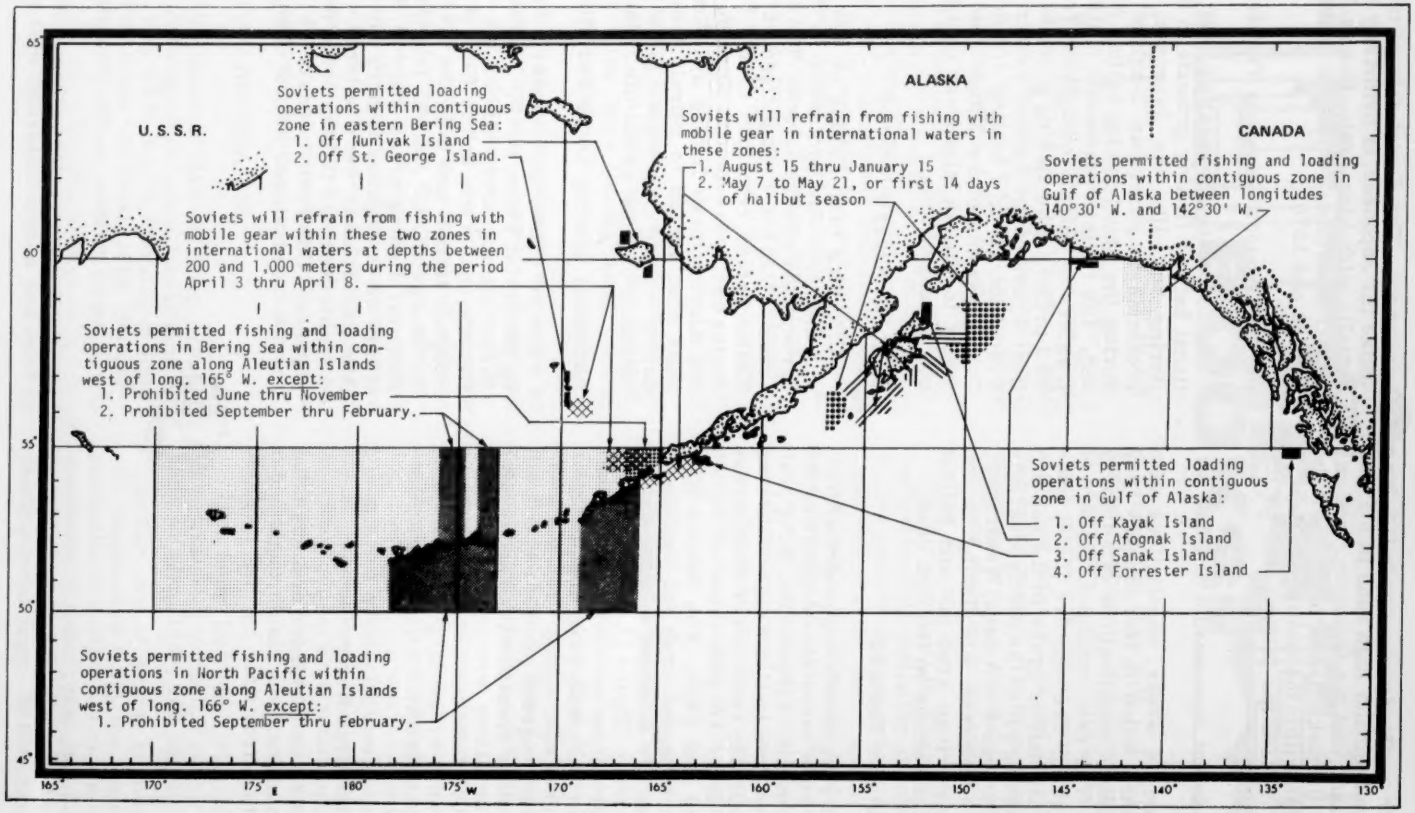
Fig. 2 - U.S.-Japan agreements implementing U.S. contiguous fishery zone May 1967, extended and modified December 1968.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ALASKA
CANADA
Soviets permitted loading operations within contiguous zone in eastern Bering Sea:
1. Off Nunivak Island
2. Off St. George Island.
Soviets will refrain from fishing with mobile gear within these two zones in international waters at depths between 200 and 1,000 meters during the period April 3 thru April 8.
Soviets will refrain from fishing with mobile gear in international waters in these zones:
1. August 15 thru January 15
2. May 7 to May 21, or first 14 days of halibut season
Soviets permitted fishing and loading operations within contiguous zone in Gulf of Alaska between longitudes 140°30' W. and 142°30' W.
Soviets permitted fishing and loading operations in Bering Sea within contiguous zone along Aleutian Islands west of long. 165° W. except:
1. Prohibited June thru November
2. Prohibited September thru February.
Soviets permitted loading operations within contiguous zone in Gulf of Alaska:
1. Off Kayak Island
2. Off Afognak Island
3. Off Sanak Island
4. Off Forrester Island
Soviets permitted fishing and loading operations in North Pacific within contiguous zone along Aleutian Islands west of long. 166° W. except:
1. Prohibited September thru February.
65°
60°
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45°
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175° E
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175° W
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155°
150°
145°
140°
135°
130°

Fig. 3 - U.S.-USSR Fisheries Agreements of December 1964 and February 1967 as extended and modified January 1969.

Essentially, they afford protection to U.S. king crab fishermen on the high seas in 6 areas off Kodiak Island, and the Davidson Bank region south of Unimak Island; they permit the Japanese to fish within the contiguous fishery zone along the Aleutian Islands and off the Pribilof Islands.

Soviet Agreements

After nearly 4 weeks, negotiations with the Soviet Union ended in late January 1969 with the signing of modifications of 3 fishery agreements. The new arrangements are of 2-years' duration. They involve Soviet fishing for king and tanner crabs in the eastern Bering Sea; fishing within the contiguous fishery zone off the coasts of Alaska, Washington, Oregon, and California; and fishing in the vicinity of American crab pot and halibut longline concentrations on the high seas.

King Crab Catches Reduced

The new arrangements negotiated with the Soviets also were more advantageous to the U.S. than the earlier agreements. King crab fishing by the Soviets in the eastern Bering Sea was curtailed by reduction of their annual catch quota from 100,000 cases to 52,000 cases in 1969 and 1970. The Soviets also agreed to an expanded crab pot sanctuary; the boundaries are identical to those agreed to by the Japanese (figure 1). Provisions of the Soviet agreement not only prohibit fishing in the sanctuary with other than pot gear for king crab but also tanner crab. In addition, the Soviets agreed to refrain from trawling for other species within the sanctuary area. The latter provision should be beneficial to U.S. fishermen in the area faced with interference by the large Soviet winter flounder fishing expeditions north of the Alaska Peninsula.

Take of Tanner Crab Restricted

The Soviet catch of tanner crab from the U.S. Continental Shelf was also brought under control for the first time by the modified agreement. The Soviet take of tanner crab, unlike the Japanese, is primarily taken incidentally with king crab. It was limited to 40,000 cases (about 6 million crabs) annually in 1969 and 1970.

Halibut Grounds Closed to Trawlers

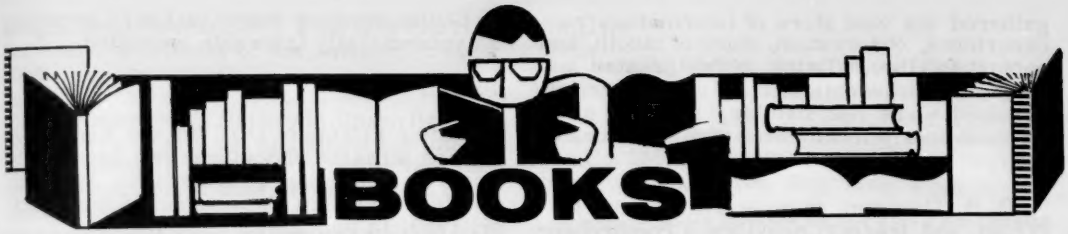
Soviet vessels operating near the traditional halibut fishing grounds in the eastern Bering Sea, like the Japanese, presented problems to American longline fishermen during the short spring halibut fishing season. The revised agreement calls for Soviet trawlers to refrain completely from fishing on 2 prime halibut fishing grounds during the first 6 days of the halibut season (figure 3). Protection of U.S. halibut fishermen from Soviet trawling in the 2 high-seas areas adjacent to Kodiak Island was continued in the new arrangements.

Crab Pot Areas Protected

U.S. king crab fishing on the high seas was also provided protection by the January agreements with the Soviets. The 6 high-seas areas of U.S. king crab pot concentrations off Kodiak Island remained closed to trawling during a period revised to coincide with present Alaskan crab fishing seasons. The Soviets also agreed to refrain from trawling during the king crab season in the same area on Davidson Bank as did the Japanese.

Additional Loading Zones Permitted

In view of the concessions on the high seas by the Soviet Union, the U.S. agreed to 3 new Soviet loading areas within the contiguous fishery zone: one in the Gulf of Alaska off Afognak Island, and 2 in the Bering Sea off St. George and off Nunivak Islands. In addition, the fishing areas allowed the Soviets within the contiguous fishery zone along the Aleutian Islands were altered. They now coincide with the fishing zones provided the Japanese. Other provisions of the 1967 agreement were continued without change.



ATLANTIC OCEAN FISHERY RESOURCES

"Report of the ACMRR/ICES Working Party of the Fishery Resources of the Eastern Central and Southeast Atlantic," FAO Fisheries Reports, No. 56, Supplement 1, Food and Agriculture Organization of the United Nations, Rome, 1968, 56 pp.

This is a summary of Working Party Studies of stocks in 3 regions--from Straits of Gibraltar to Cape Blanco; from Cape Blanco to mouth of Congo River; and from Congo southwards. It reports the present state of the stocks, fishing effort, proposals for improved reporting of fishery statistics, observations on problems of mesh regulation--and recommends areas of future research.

BRITISH ISLES

"British Freshwater Fishes--Factors Affecting Their Distribution," by Margaret E. Varley, Fishing News (Books) Ltd., London, 1967, 148 pp., illus.

Some British freshwater fishes have an economic value as food, notably salmon and trout and, to a lesser extent, eels. Their real value, however, is recreational--the provision of raw material for angling. Methods of fishing vary with the species, and anglers want to know what sort of fish to expect in a given location. Dr. Varley has answered their questions in this comprehensive treatment of the origins, environmental factors, distribution, feeding and commercial aspects of the freshwater fishes.

ESTIMATING ABUNDANCE

"The Abundance of Hake off South Africa," by D. H. Cushing, Fishery Investigations, Series II, Vol. XXV, No. 10, Ministry of Agriculture, Fisheries and Food, 1968, Her Majesty's Stationery Office, London, 20 pp., illus.

An echo sounder that resolves signals from fish into individual traces was used in a survey for hake within 4 fathoms of the bottom, between Cape Town and Walvis Bay in February 1966. With a statistical treatment of the results, it was possible to estimate the sizes of fish and density in numbers per cubic meter. The true power of this new technique may lie in the capacity to estimate absolute abundance acoustically.

In this paper, D.H. Cushing describes the method for estimating the absolute abundance of fish targets in size groups by acoustic methods. As the fish cannot be identified acoustically, he suggests that such surveys be supported by catches. In an exploited area, catches of the commercial fleet can be used for identification. In an unexploited area, the acoustic method endows the research vessel with the sampling power of a commercial fleet.

FRESHWATER RESEARCH

"Freshwater Fisheries Field Techniques--Tagging, Transportation, Mortality, and Drift Sampling," by C. J. Hardy, Fisheries Technical Report No. 27, New Zealand Marine Department, Wellington, 1968, 35 pp., illus.

This report describes a preformed wire loop for tagging trout; a thermally insulated lightweight livebox for holding and transporting trout; handling mortalities in trout sampling; and a simple lightweight drift sampler for streams. It also includes sections on electric fishing, anesthetics and sedation, fin clipping, and water temperature changes.

GEAR

"The Seine Net--Its Origin, Evolution and Use," by D. B. Thomson, Fishing News (Books) Ltd., London, 1969, 192 pp., illus.

In the past 50 years, commercial fishing has progressed from the state of a highly skilled but primitive art to a science. Documentation of fishing gear and methods is extremely important in a world of rapidly expanding technology. In the past, a fisherman

gathered his vast store of information from experience, observation, word of mouth, and ancient folklore. Today, a far greater and much faster dissemination of information is required. The fish-catching side has been the most poorly documented of all sections of the fishing industry.

D. B. Thomson, an expert mariner, fisherman, and teacher, provides a comprehensive and authoritative review of the seine net. He traces its history, evolution, and adaption to the needs of various fisheries and he provides an exhaustive record of its practical use in different parts of the world.

MEDICAL GUIDE

"Handy Medical Guide for Seafarers, Fishermen, Trawlermen, Yachtsmen," by R. W. Scott, Fishing News (Books) Ltd., London, 1969, 86 pp., illus.

This is a simple handbook suitable for ready reference in dealing with medical problems at sea. It is a practical aid designed primarily for conditions in distant-water trawlers. But it should be of value to other fishermen, seamen, yachtsmen, oil-rig crews, and to landsmen in isolated situations.

The following publications are available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209:

HATCHERY OPERATIONS

"Recent Advances in Artificial Culture of Salmon and Steelhead Trout of the Columbia River," by Fred Cleaver, Fishery Leaflet 623, Fish & Wildlife Service, Department of the Interior, 1969, 5 pp., illus.

Between 1948 and 1962, 21 hatcheries were constructed or remodeled on tributaries to the lower 180 miles of the Columbia River. By 1962, there was some doubt that the hatcheries contributed enough salmon and steelhead trout to justify their costs. Further construction was deferred until the value of hatchery production could be measured.

This is a report on the results and methods of a cost-benefit study. The catches from fish reared in the hatcheries were found to have increased rapidly, beginning in 1964. By 1967, the benefits from operation of the hatcheries appeared well in excess of their costs. The Oregon moist pellet diet seemed to be the greatest single factor in providing an economically favorable operation.

PESTICIDES

"Some Effects of DDT on the Ecology of Salmon Streams in Southeastern Alaska," by Roger J. Reed, SSR-Fisheries No. 542, Fish & Wildlife Service, Department of the Interior, 1966, 15 pp., illus.

Most watersheds in southeastern Alaska have valuable stands of Sitka spruce and western hemlock. Many of these watersheds contain streams with significant populations of trout and salmon. Concern about timber losses from infestations of black-headed budworm and hemlock sawfly caused U.S. Forest Service, in 1960, to propose a pilot study to evaluate effect on fish and wildlife of DDT in forested watersheds.

This paper describes a 4-year study of DDT's effects in 2 Alaska salmon streams. Direct harmful effects on fishes from DDT sprayed at a relatively low rate were not demonstrated, but the accompanying drastic reduction of aquatic insects may have reduced growth and survival of salmon and trout significantly.

LAKE MICHIGAN

"Bottom Trawl Explorations in Southern Lake Michigan, 1962-65," by Norman J. Reigle, Jr., Circular 301, Fish & Wildlife Service, Department of the Interior, 1969, 35 pp., illus.

The fish population of Lake Michigan has changed dramatically since the sea lamprey became plentiful--and the valuable food species subsequently declined. The recent explosive invasion by the alewife has had additional effects on the fauna. To survive, fishermen must now turn to the abundant low-value species, such as alewives and bloaters. In 1965, a limited trawl fishery landed over 12 million pounds of fish, primarily alewives and chubs.

This paper summarizes bottom trawl explorations from 1962 to 1965. Their purpose was to gather information on the seasonal depth and geographic distribution of abundant unutilized species in relation to their availability to a growing trawl fishery.

"Bottom Trawl Explorations in Green Bay of Lake Michigan, 1963-65," by Norman J.

Reigle, Jr., Circular 297, Fish & Wildlife Service, Department of the Interior, 14 pp., illus.

The commercial fishery in Green Bay was formerly a gill net and pound net fishery based primarily on common whitefish, lake herring, and yellow pike or walleye. If commercial fishing in Green Bay is to survive, fishermen will have to turn to the efficient harvesting of large volumes of low-priced industrial fish. Trawling is one way to accomplish this goal.

The aim of this study was to obtain the basic seasonal and bathymetric data needed to establish more effective and efficient methods of harvesting the existing fish resources. The paper reports the results of 179 exploratory drags, made during 11 cruises, to determine if bottom trawling in Green Bay is commercially feasible.

SHRIMP

"Length-Weight Relation and Conversion of 'Whole' and 'Headless' Weights of Royal-Red Shrimp, Hymenopenaeus robustus (Smith)," by Edward F. Klima, SSR-Fisheries No. 585, Fish & Wildlife Service, Department of the Interior, May 1969, 5 pp.

Over 70,000 pounds of headless (heads off) royal-red shrimp, worth more than $55,000, were landed during 1967. It has been estimated that the 3 commercial fishing areas off the southern U.S. could produce 1.6 million pounds of 20-count whole shrimp annually.

The development of a royal red shrimp fishery demands biological studies. Information on length-weight relation is required for studies of condition, growth, sexual maturity, and equilibrium yield in terms of weight. This paper gives the length-weight relation of royal-red shrimp for each of the 3 commercial fishing areas.

--Barbara Lundy

WHAT IS THE GREATEST DEPTH OF THE OCEAN AND WHERE IS IT?

According to the latest records, the greatest depth of 37,782 feet was observed in 1962 by the British survey ship COOK in the Mindanao Trench near the Philippines. This spot is now known as the Cook Deep. As long ago as 1927, depths in excess of 35,000 feet in the same area were reported by the German cruiser EMDEN.

In recent years, many other deeps have been measured by oceanographers. Some of those reported by British, Soviet, and U.S. ships follow:

In 1952, the British survey ship CHALLENGER located a depth of 35,640 feet in the Marianas Trench off Guam (the Challenger Deep). This depth was measured by an echo sounder; it took $7\frac{1}{4}$ seconds for the sound to reach the bottom. To confirm the sounding, a weighted cable was lowered to the bottom; this lowering required 90 minutes.

In 1959, the Soviet vessel VITYAZ reported a depth of 36,200 feet near the Challenger Deep. The Marianas Trench had been sounded in 1927 by the Japanese survey ship MANSHU, which recorded a depth of 32,190 feet.

On January 23, 1960, the bathyscape TRIESTE descended into the Marianas Trench to a depth of 35,800 feet.

Although most publicity has been given to the Marianas and Mindanao Trenches, very deep soundings have also been recorded in the Southern Hemisphere. In 1952, the U.S. research vessel HORIZON recorded a depth of 34,884 feet in the Tonga Trench, south of Samoa Islands. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

INTERNATIONAL

UN Calls for World Conference on Pollution

The United Nations has called for a world conference on pollution in 1972. The General Assembly has approved a resolution summoning a conference to promote international cooperation in "eliminating the impairment of human environment." The resolution was sponsored by 54 of the 124 member nations. It alerts all nations to the dangers resulting from man's ability to change and shape his environment. It emphasizes the "continuing and accelerating" pollution of water and air.

Sweden Is Prime Mover

Sweden is prime mover of the conference. She warns that the world soon may have "no escape" from the many forms of international pollution. Sweden outlawed the use of DDT in Apr. 1969.

Purposes of Conference

The Swedes see 2 principal reasons for the conference: (1) to exchange ideas on fighting local and regional pollution (including help for developing nations rushing into industrialization and urbanization). (2) To establish pollution-control standards and to determine who will pay costs of controlling pollution when it crosses national boundaries or threatens common environment. ('Resources,' Vol. 6, No. 1, 1969.)

World Program Launched to Conserve Sea Turtles

A campaign has been launched to save the world's sea turtles from extinction. Experts attended a 4-day conference in Switzerland to set plans. The conference was organized by the International Union for Conservation of Nature and Natural Resources and sponsored by the World Wildlife Fund.

Scientists and nature lovers are alarmed at the rate at which the 7 surviving species are being depleted. The turtles are being used for oil, calipee for soup, meat, eggs, leather, and shell.

The turtles are vulnerable from birth to death. The females often are killed when they come ashore to lay eggs; the eggs are taken by humans for food. Few baby turtles survive the long crawl from beach into sea; once in the sea, they face many enemies.

Conference's 7-Point Plan

The conference decided on a 7-point plan to "save this valuable marine resource from destruction":

(1) Action on breeding beaches to insure maximum incubating and hatching of turtle eggs.

(2) A survey and analysis of existing exploitation of marine turtles to provide basis for regulating size of commercial operations.

(3) A broad information program to educate public.

(4) Beach surveys to gather information for governments involved.

(5) Establishment of sanctuaries for turtles on islands in Atlantic, Pacific, and Indian Oceans.

(6) Appointment of scientist to coordinate conservation efforts.

(7) Periodic meetings of specialists to discuss conservation problems and progress. ('South African Digest,' May 9.)

U.S. & USSR Jointly Survey Ichthyoplankton on Georges Bank

R/V 'Prognoz' of the Soviet Atlantic Research Institute of Fisheries and Oceanography (ATLANTNIRO) and 'Albatross IV,' research vessel of BCF's Biological Laboratory at Woods Hole, Mass., have studied together

plankton samples and abundance of fish eggs and larvae on the southern and eastern parts of Georges Bank. The survey was part of the U.S.-USSR scientific exchange under the bilateral mid-Atlantic Fisheries Agreement.

Methods

The vessels operated simultaneously for 24 hours on 6 sampling strata. The survey's first phase ran from April 15 to 24; the second was scheduled for May 19 to 29. The vessels met off Martha's Vineyard to exchange personnel and equipment. During the first phase, a Soviet scientist boarded the Albatross IV and a U.S. biologist went aboard the Prognoz. Only about a third of the first phase had been completed when mechanical trouble forced Albatross IV into Boston for repairs. The second phase was expected to take place as scheduled.

Prognoz's Future Plans

The Prognoz will stay on Georges Bank until early August and explore electric light fishing for Atlantic saury. Other ATLANTNIRO research vessels are in the area longlining for swordfish.

U.S. and Argentina Conduct Oceanographic Project

For the third successive year, the U.S. and Argentina have collaborated in joint oceanographic studies off the South Atlantic coast.

The icebreaker USCG 'Glacier' has just completed the 1969 program in the Bay of San Mathias. Dr. Jack W. Pierce of the Smithsonian Institution and several Argentine scientists boarded her in Buenos Aires on April 9. Deep-coring operations, part of a continuing coastal sedimentation study, were finished on April 14. 'Glacier' had worked in the Wedell Sea from December 1968 to April 1969 with the Argentine icebreaker 'San Martin.'

Previous Studies

In December 1968, Dr. Frederic R. Siegel of George Washington University had worked in the project aboard 'Edisto'. Drs. Pierce and Siegel try to alternate in the research. They work aboard USCG icebreakers en route to and from the Antarctic. Their first voyage was aboard 'Oceanographer' in 1967.

Reports to Argentina

The U.S. scientists present regular progress reports to Argentine authorities on the results of this joint operation. The program is a fine example of cooperative bilateral scientific research. (U.S. Embassy, Buenos Aires, Apr. 23.)

Charges Up 10% for Chilean and Peruvian Fish Meal Shipped to U.S.

Charges for shipping fish meal from Peru and Chile to U.S. Gulf of Mexico and Atlantic ports increased 10% on March 10. The increase was due to a surcharge on all goods shipped. It was agreed to by the West Coast South American Northbound Conference, which is empowered to set rates for shipping to U.S. ports.

The surcharge is designed to restore to the shippers money lost during recent longshoremen's strike, and to gain funds to pay for the new contracts with longshoremen.

Rates in effect before the strike (sacked meal):

Less than 300 tons	$29.50 a metric ton
300-1,000 tons	$27.50 a metric ton
Over 1,000 tons	$24.50 a metric ton

The new rates simply add 10%. (Federal Maritime Commission.)

Japanese Survey Philippine Market for Canned Mackerel

The Japan External Trade Organization (JETRO), a government trade-promotion agency, recently published survey results of the canned mackerel, sardine, and saury market in the Philippines. The survey found good potential for increased canned mackerel exports.

There are only 2 fish canneries in the Philippines. One, the White Rose Packing Corp., with modern facilities, has a daily processing capacity of 120 tons. Due to lack of raw material, the plant has not been put into operation. The corporation has its own fishing boats but finds it more profitable to sell the catch fresh. Another problem is the high tariff on imports of tinplate (40% ad valorem) and tomato sauce (150% ad valorem). The canning industry has appealed for tariff cuts on those items, but the government has refused.

Other Canneries

The second cannery, Visayan Packing Corp., a wholly Philippine-owned firm established in 1955, is the only fish cannery in operation. It packs tuna, mackerel, sardines, and tangerines, and exports frozen tuna to the U.S. A third tuna and mackerel cannery is scheduled for construction by the end of 1969.

Canned Sardine Imports Banned

The Philippine Government, in 1963 and again in 1967, banned canned sardine imports from the Union of South Africa because of her apartheid policy. In 1967, the Cebu United Enterprises had requested the Government to allow imports from South Africa, claiming South African product cost less than Japanese imports. Cebu also claimed that Japanese and U.S. canned sardines were actually South African sardines packed under different labels.

Japan Major Canned Mackerel Supplier

The Philippine population and the demand for protein continue to grow. These cannot be adequately supplied domestically, so Japan probably will continue to be a major supplier of canned mackerel. Since the Japanese product does not compete with Philippine domestic brands, imports from Japan are likely to increase. To expand the canned mackerel and saury market in the Philippines, efforts must be made to promote greater consumer interest and acceptance. ('Nihon Suisan Shimbun,' Apr. 4.)

Japanese-Australian Shrimp Venture Makes Good Hauls

A Nihon Suisan-owned fleet--6 shrimp trawlers (100 gross tons) and one 386-ton processing vessel--operating in Gulf of Carpentaria, northern Australia, made good hauls of shrimp (mostly banana) in mid-April. Catch per vessel per day was around 660 pounds; about 570 pounds is considered the break-even point for 100-ton-class shrimp vessels.

Other Joint Ventures

Nihon Suisan began shrimp fishing in Gulf of Carpentaria in Oct. 1968 jointly with Australian Hickman Company. They established the Northern Research Pty. Ltd. at Darwin. Two other Japanese-Australian shrimp ventures also are based at Darwin. ('Minato Shimbun,' Apr. 17.)

S. Korean Team Recommends Tuna Fleet & Freezer Plant for El Salvador

A S. Korean team studied El Salvador's fisheries for 3 weeks in late Jan.-early Feb. 1969. It has recommended that El Salvador obtain 10 longliners, build a freezer plant, and enter the eastern tropical Pacific tuna fishery.

The team's 114-page report recommends: (1) purchase of ten 200-300-gross-ton longliners, (2) build a 1,000-ton-capacity (20 tons per day) shore freezer plant at Acajutla, and (3) develop the technical skill to use those facilities.

S. Korea would provide technical experts to train fishermen and get Salvadoreans started; she could build the vessels in her own boatyards.

Study Team's Thinking

The project could survive on an annual catch of 6,000 metric tons of assorted tunas; about 27% (yellowfin, skipjack, bluefin, albacore) could be marketed in the U.S. The rest could be sold to Japan. All tunas would be

sold frozen. El Salvador could encourage landings by foreign vessels to utilize plant's excess capacity and allow its operation when domestic vessels were unable to fulfill quotas.

Relations With IATTC

The yellowfin catch--1,080 tons, about 18% of 6,000-ton-projected tuna total--would not involve difficulties with the U.S. over the IATTC. This is because the yellowfin catch would be less than the 4,000-ton threshold limit agreed to by IATTC in March. For 1969, after closure, vessels under 300 tons will be permitted unrestricted fishing until aggregate yellowfin catch for a country reaches 4,000 short tons. After that, all vessels would be subject to 15% limitation on yellowfin. El Salvador is not an IATTC member.

A Trip's Expenses

These are some projected total expenses for a 5-month fishing voyage for a vessel with 24-27 men: crew salary, $6,600 (less than $60 per man per month); food $600; bait $7,800.

The S. Koreans have about 40 idle long-liners they are recommending to El Salvador.

IAFMM Meetings Scheduled

The Executive Council of the International Association of Fish Meal Manufacturers (IAFMM) met in Madrid, Spain, Apr. 15-16. Representatives of fish meal producers from 12 countries attended.

The Association's Director reviewed the latest information on current and potential production, consumption trends, and market prospects.

Meetings Slated

The Ninth Annual Conference is scheduled for Cannes, France, Oct. 6-10, 1969. Executive Council and Scientific Committee meetings have been scheduled for April 1970 in the United States (possibly at College Park, Md.). (U.S. Embassy, Copenhagen, Apr. 29.)

NEW DOCUMENTARY SERVICES
(Provided by the Food and Agriculture Organization of the United Nations, Rome, Italy)

The wealth of technical, economic and social information, contained in some 25,000 publications and documents produced by FAO since its creation in 1945, is now readily available through the services provided by the FAO Documentation Centre.

- Published indexes (Monthly "Current Index" - since January 1967 - and retrospective "Special Indexes" - for the period 1945-1966) permit the selection of documents of interest in the fields of agriculture, fisheries, forestry, nutrition, rural economy, etc., through thousands of subject matter, author and title references in each field.

- A "Question and Answer" service provides, on request, ad hoc bibliographies on specific subjects.

- Documents of interest can be obtained in original form (printed or mimeographed) or, if out of stock, in the form of photocopies or microfiches.

- The "Current Index" is sent, free of charge, on request. Details on other services (Retrospective Indexes, "Question and Answer" service, Reproduction Services) will be obtained by writing to the: FAO Documentation Centre (Ref.P.69), FAO Headquarters, Via Terme di Caracalla, 00100, Rome, Italy.

FOREIGN

CANADA

PLANS EXCLUSIVE FISHING ZONES

Canada will establish exclusive fishing zones on her east and west coasts, Minister of Fisheries and Forestry Jack Davis announced April 5. Lines will be drawn from headland to headland on both coasts. The lines will cover immediately all sections where Canada's territorial waters and fishing zones can be measured from the same baseline.

There are a few important exceptions, Davis noted. "I am thinking particularly of the Gulf of St. Lawrence. In this case, where it may not be desirable to close off all of the Gulf as internal waters, we can still make it an exclusive Canadian fishing zone. However, we will first have to change the law. This we intend to do in the next session of Parliament."

The Minister indicated that baselines will be drawn from headland to headland down the east coast of Nova Scotia. "This we can do right away," he said, "because there is no conflict between inland waters (i.e., navigation, etc.) and fishing zones along this section of our coast."

Statement of Intentions

The formal statement of the Canadian Government's intentions was outlined as follows:

The Canadian Government will shortly issue a list of geographical coordinates for the establishment of straight baselines, further defining Canada's territorial sea and exclusive fishing zones on both our east and west coasts.

Additional Baselines

Maps published in 1967 already show straight baselines down the coast of Labrador, and around the east and south coasts of Newfoundland. Further baselines will now be drawn from headland to headland down the east coast of Nova Scotia, and up along the west coasts of Vancouver Island and the Queen Charlotte Islands. These additional lines will also enclose as internal waters of Canada numerous bays and inlets. These will in their entirety become Canada's fisheries waters.

New Maps

Maps will be published illustrating this further demarcation of Canada's internal waters, territorial sea, and exclusive fishing zones. These maps will show several important gaps remaining along east and west coasts after issuance of the coordinates. The Government will deal with these gaps after amending the Territorial Sea and Fishing Zones Act. This is scheduled for Parliament's next session.

To Amend Present Act

At present, the Territorial Sea and Fishing Zones Act provides only for drawing straight baselines. These define Canada's internal waters, on the landward side of the baselines, and her territorial sea and fishing zones, which extend a total of 12 miles seaward of the baselines. To provide added flexibility for dealing with certain coastal areas, the Act will be amended to permit the Governor-in-Council to draw "fisheries closing lines." The lines will enclose these areas as exclusive fishing zones, without affecting the limits of Canada's internal waters or territorial sea.

Traditional Fisheries & Treaties

Traditional fishing practices of other countries will be considered. However, establishment of baselines, and fisheries closing lines along remaining sections of coastline, will make it possible to conclude negotiations for phasing out these traditional fishing practices. Existing treaty rights will be respected. Also, it is proposed to maintain the present reciprocal fishing arrangements with the U.S.

Minister Davis concluded that this statement involving changes to Canada's Territorial Sea and Fishing Zones Act was being made now to advise other countries of Canada's intention to complete a national system of exclusive fishing zones. (Canadian Dept. of Fisheries and Forestry, Apr. 5.)

* * *

Canada (Contd.):

MARITIME LANDINGS IMPROVE

The fishery catch in Canada's maritime provinces--Nova Scotia, New Brunswick, and Prince Edward Island--for the first two months of 1969 was substantially higher than in 1968 and 1967. It also improved in total value, although prices per pound were lower than in 1968 and 1967. The lower unit value in 1969, compared with first 2 months of 1968, appeared related to much heavier herring landings, which command lower prices. During Feb. 1969, only haddock, halibut, pollock, and scallop landings were below the 3-year average in quantity. (U.S. Consulate, Halifax, Mar. 21; Dept. of Fisheries of Canada, Mar. 18.)

Maritime Fish Landings

	Jan.-Feb.		
	1969	1968	1967
Landings (million lbs.). . . .	98.6	68.3	63.0
Total value (million C$). . .	4.9	3.6	3.8
Price per pound (C$)1/. . . .	0.0497	0.0527	0.0603

1/Paid vessel by first buyer.

* * *

NEWFOUNDLAND LANDINGS INCREASE

Newfoundland landings in first-quarter 1969 were considerably higher than in same period of 1968. Landings totaled 281 million pounds through March, compared to 224 million in 1968. Ex-vessel value was up from C$4 million in 1968 to $4.3 million in 1969.

Species Landed

Landings of the more expensive varieties--cod, haddock, halibut, flounder, sole, turbot, and pollock--were generally down for all months. Only haddock had increased by the end of March; cod had an initial upturn in January, but was down nearly 6 million pounds by end of quarter.

Landings of less expensive varieties--ocean perch, hake, catfish, herring--gained steadily. Herring particularly showed a phenomenal gain; it increased over 50 million pounds for first 3 months. This is especially noteworthy in view of the 'dead, red herring' scare plaguing fishermen in Placentia Bay and in St. Mary's Bay. Scallops also showed a sharp upturn due to greater demand and more refined processing. (U.S. Consul, St. John's, Apr. 25.)

* * *

PRICE OF L. ERIE YELLOW PERCH TO BE STABILIZED

The Canadian Fisheries Prices Support Board (FPSB) has one million Canadian dollars available to stabilize the price paid fishermen for yellow perch from Lake Erie. This program is intended to firm up prices paid fishermen by both the processing industry and the trade. FPSB will buy frozen perch fillets from processors on condition that fishermen are paid a boat price of 8¢ a pound for spring-caught perch (Apr. 1 to May 31, 1969) and 10¢ a pound during rest of the year (June 1, 1969, to Mar. 31, 1970).

1968 Prices

The Board also bought large quantities of Lake Erie perch in 1968. Those purchases were conditional on fishermen being paid 7¢ in the spring and 10¢ in the fall. The main difference in 1969 is that the Board will not purchase spring perch "in the round."

Not A Subsidy

All of the Board's costs should be recovered by resale of the fish before Mar. 31, 1970, eliminating any element of subsidy in this year's program. (Canadian Dept. of Fisheries and Forestry, Apr. 3.)

* * *

CALLS FOR TENDERS ON FROZEN GROUNDFISH SUPPLIES

Fisheries and Forestry Minister Jack Davis announced April 24 that the Fisheries Prices Support Board was calling for tenders on the supply of Canadian frozen groundfish products. This followed his earlier announcement of a government purchasing program to strengthen and stabilize market prices for frozen groundfish products.

The program is one in a series designed to assist groundfish industry recovery from the severe market declines that began in 1967. Their object is to forestall further distress selling--and so raise market price to the point where it will cover the efficient producers' basic costs.

Canada (Contd.):

80 Processors Invited

The Fisheries Prices Support Board was to invite tenders from about 80 frozen cod and ocean perch processors on the Atlantic Coast. Initial contracts were to be awarded early in May.

Davis said this and other programs, including a working capital loans program already in operation, will have a salutary effect on the market. He added that the outlook for the 1969 season is good. (Canadian Dept. of Fisheries, Apr. 24.)

* * *

RECORD HARVEST IN 1968

Canada's harvest of fish and shellfish set another record in 1968. Estimated fresh- and salt-water landings were nearly 2.8 billion pounds; landed value was C$185.1 million.

The yield from sea fisheries on both coasts was more than 2.6 billion pounds; landed value, $169.1 million. The fresh-water fish harvest was 120,000,000 pounds worth $16 million exvessel. Landings by Atlantic coast fishermen were just under 2.4 billion pounds; landed value was $113.8 million. Pacific coast fishermen landed 255.8 million pounds worth over $55.3 million.

Lobsters & Salmon Led

Again, lobsters were the most valuable east coast species--over 37 million pounds with landed value of $25.1 million.

Salmon took the lead for British Columbia fishermen: nearly 180 million pounds with landed value of $44.5 million.

Pacific salmon fishermen enjoyed good catches, but returns to the gill-net fleet were particularly high. Landings by salmon gillnetters were worth $20 million, nearly 40% above the 1958 record. The value of catch by salmon seiners, nearly $13 million, was $3.5 million above 1967.

B.C. Halibut

Halibut landings by British Columbia fishermen were 28 million pounds; landed value, 7.1 million dollars, up about 10% from 1967. Prices to fishermen averaged around 25 cents a pound, unchanged from 1967.

Herring Down

The herring reduction fishery was closed in 1968 due to low stock level. Production was limited to bait and experimental fishing. Value of landings was only $160,000.

Groundfish & Shellfish

Landings of grey and ling cod and sole, and other groundfish, rose about 10% over 1967. Landings were worth 1.8 million dollars to fishermen. Landings of most shellfish were down from 1967, although shrimp producers recorded a slight increase.

Phenomenal Queen Crab Fishery

A highlight of the Atlantic coast fishery was the almost phenomenal growth of the queen crab fishery. It paralleled spectacular increases in herring catches. Until 3 years ago, the queen crab was regarded as a nuisance. Then it became a money-maker for fishermen and a table delight for gourmets. This resulted from efforts of federal-provincial agencies and the fishing industry.

From zero in 1965, landings reached 600,000 pounds in 1966. In 1967, the catch jumped to 2,000,000 pounds. The 1968 catch exceeded 9.3 million pounds worth over $886,000. This hardy, 8-legged crustacean is providing new income for more fishermen.

Atlantic Herring Boom

The growth of the Atlantic herring fishery has been spectacular. It began when large purse seiners began to make heavy catches. This was followed closely by the introduction of midwater trawl fishing sponsored by federal and provincial departments. The gear has special advantage of being able to catch herring in daylight. During that period, they are largely dispersed and are found usually at greater depths than during darkness. In darkness, the purse seine is still the most effective fishing tool.

The effectiveness of the midwater trawl for herring was demonstrated effectively by a 156-foot stern ramp trawler out of Riverport, N.S. In one week's fishing, she landed 1,200 tons; the heaviest single catch was 427 tons.

Canada (Contd.):

Seaweed Industry

The seaweed industry, too, is showing rapid growth on the Atlantic coast. One seaweed, Irish moss, has become very important economically to some fishing communities. In the past 25 years, the Irish moss harvest in the Maritime Provinces (N.S., N.B., P.E.I.) has grown from 1.5 million pounds, worth $30,000 exvessel, to over 79 million pounds worth nearly $2.5 million.

To promote this industry's growth, a Marine Plants Experimental Station was built by Canada's Department of Fisheries at Miminegash, P.E.I. in 1966. This plant provides mechanical drying facilities for Irish moss. Within 2 years, 2 commercial plants were established nearby. Now the Station focuses on general development of Canada's marine-plants industry where there is a seaweed potential.

Besides Irish moss, other seaweeds in the Atlantic Provinces are utilized.

Upward Trend

The 1968 story of increased production is in line with the general trend of past 15 years. In the decade ending in 1966, Canada's fish production gained 18%; returns to fishermen in dollars rose 67%. Better fishing techniques and more efficient vessels and gear are credited. ('Fisheries of Canada,' Apr.)

* * *

BEGINS PRICE DEFICIENCY PAYMENTS FOR SALTED COD

Canada's Fisheries Prices Support Board is being asked to support the price paid to Atlantic coast inshore fishermen for 1969 salted cod production. This deficiency payment program is designed to assist fishermen who suffered severe price declines as a result of devaluation and oversupply in foreign markets in 1968. These fishermen would encounter similar conditions in 1969.

The Payment

The Board will pay fishermen an amount to bring total price they receive for 1969 catch up to 1966-67 level. This supplementary payment will be made on certain grades of fish only. It will be made directly to the fishermen after the season is over and after the salted cod has been sold to exporters. Payment is being limited to certain grades to encourage production of better-quality fish.

Each fisherman would receive half the difference between price obtained for each specified grade of salted cod and "target" price for same grade. This "target" price is the one fishermen may receive from the private fish trade as market conditions improve.

Exact Payments Not Yet Fixed

At present, the market returns for 1969 cannot be forecast. So final payments to fishermen and support levels cannot be worked out precisely. Had the new scheme been in effect in 1968, the final price received by each fisherman would have been raised by 50% of difference between 1968 price and government's new "target" price.

The program is an interim measure. Other steps will be outlined to reorganize salted cod industry in 1970 and thereafter.

An advisory committee of fishermen and salted cod fish trade is being appointed to advise the Minister on administration of this new program and its impact on the incomes of fishermen in Newfoundland, Quebec, and Maritime Provinces. (Canada's Dept. of Fisheries and Forestry, Apr. 25.)

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OUTLOOK FOR EAST COAST FISHERIES IS OPTIMISTIC

A generally optimistic future for Canada's East Coast fishing industry was forecast in mid-March by the Atlantic Development Board (ADB), but employment prospects are expected to drop sharply.

The forecasts are contained in a review of the industry by ADB staff and fishery experts in 3 provinces. The industry is expected to increase its groundfish markets by 50% in 1967-1975.

Two-thirds of output now goes to the U.S.; Canada is expected to retain its share of total U.S. consumption, which is forecast to rise. Canadian demand will increase 20% to 130 million pounds.

Canada (Contd.):

Prospects are good for production of fish meal and oil from herring reduction. Large new fish plants are indicated in the Fundy region, Western Nova Scotia, and Eastern Newfoundland.

1970 Demand May Equal 1966's

The study says it will be 1970 before demand reaches the 1966 level. That preceded a decree by the Roman Catholic Church in the U.S. permitting the eating of meat on Friday.

Prices also were depressed by overrapid industry expansion. They have begun to improve.

Industry Needs Major Changes

While near- and longer-term outlook appears good, overall improvements will not be made without major industry changes. In 1965, the primary fishery employed about 45,000 persons, 8% of labor force in Atlantic Provinces. Of these, only 6,000 worked more than 10 months of year, 27,000 worked 5 to 10 months, and remainder less than 5 months. The industry contributes about 6% to net commodity production in the region: from 2.2% in New Brunswick to 10.5% in Prince Edward Island. It contributes about C$53 million to the region's total manufacturing output of $514 million. It employs 10,700 people in 520 fish-processing plants.

Deep-Water Fishing Trend

The major change predicted by the report is a quickened trend from inshore to deep-water fishing. This will lead to a substantial reduction in job opportunities in inshore fishery; increased manpower needs offshore will be only partial compensation.

Compared to inshore fishery, landed values per fisherman in Atlantic offshore fishery are high; these averaged $7,300 in 1964. The report sees growth potential here for East Coast fishery.

An expanded trawler fleet will draw on manpower reserves in inshore fishery. But a fleet increase of 3 or 4 times would provide jobs for relatively few fishermen.

Sufficient Resources

Contrary to common fears of depleting North Atlantic fisheries, the report says there is no doubt that sufficient resources exist to permit expansion of Canada's catch.

Landings and processing have tended to be concentrated in fewer ports--but not necessarily where greatest economic benefit might have resulted. A clear advantage has developed from larger-scale operations. The report states: "It is the larger firms which create the greater value added per man-hour on per dollar of wages. The conclusion is inescapable that the benefits to the region will be greater if future increases in production take place in a relatively small number of large processing plants."

Where Expansion Is Desirable

No expansion of groundfish capacity is desirable in the Gulf of St. Lawrence. Additions to processing should not be encouraged in Eastern Nova Scotia and Southern Newfoundland--but encouraged in Fundy area, Western Nova Scotia, and Eastern Newfoundland.

The study suggests Shelburne as the growth port in Western Nova Scotia. One major port in Charlotte County, N.B., should be selected as development point on Fundy shore. Harbour Grace is best suited for development as trawler harbor in Eastern Newfoundland. ('The Globe and Mail,' Mar. 21.)

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DAVIS ASKS END OF CANADA-U.S. FISHERY TARIFFS

On May 6, Canadian Fisheries Minister Jack Davis called for abolition of tariffs on fish products between Canada and the U.S. He spoke at annual meeting of Fisheries Council of Canada.

Mr. Davis said: "We must obtain reciprocity with the U.S. not only in fishing in each other's waters, but also on the trade front as well. We must be able to buy our supplies and equipment at the lowest possible price and we must be able to sell our products with a minimum of red tape.

"Essentially we must wipe out the tariff barriers between us. We must do away with quotas. And we must make sure, with the

Canada (Contd.):

aid of a superior Canadian Inspection Service, that there is never any question about the quality of Canadian fish."

Exporting Nation

Davis said Canada will always be an exporting nation. "We have a larger source relative to our population. We are also out-fishing our American brethren east and west, north and south. We are out-fishing the Russians and Japanese as well. We are catching more fish per fishermen, per boat and per day at sea."

Price the Problem

The most difficult area in industry was price, he said. "Most prices, and certainly most costs, have been going up. But the export price for some of our principal products has tended to go down. As a result we are being caught, increasingly, in a cost-price squeeze. We are being hurt even when the retail price for our fish in other countries is going up."

He noted that the groundfish industry is being squeezed hard. Plants had closed and new facilities were standing idle. "This doesn't make much sense in the context of rising consumption and a stable price at the retail level in the United States." Many reasons had been given for the setbacks, but he blamed the industry's financial weakness. Some groundfish exporters were so badly off that they had to convert fish into cash immediately.

Price Support

Davis revealed: "In order to correct the situation the Canadian government has moved in. We have asked our fisheries prices support board to help stabilize the market.... This is not a subsidy operation. We do not intend to lose money." The board will buy fish at market prices, hold it until prices improve, and recover costs in market place.

Limiting Licenses

He said some things will have to be done in interests of conservation and good management. "One of these things is license limitation. We will have to limit the entry of new boats into some of our fisheries. Our lobster fishery on the East Coast is a case in point. Our salmon fishery on the West Coast is another. In both of these instances we are overequipped. We are overequipped by a factor of 2 to 1. So a gradual reduction on boats and gear is imperative.

"It is imperative if our fishermen are to earn a decent living and it is imperative if we are to cut down on the social assistance which is being paid to part-time fishermen on both coasts."

Predicts Fewer Firms

The Canadian Fisheries Minister predicted fewer firms and fewer fishermen in the industry. But the overall outlook was promising. Prices were rising and costs levelling off. "The cost-price squeeze will subside and life will be a little easier all round," he concluded.

EUROPE

USSR

SONAR STUDIES PACIFIC SALMON MIGRATIONS

Scientists from the Kamchatka Branch of the Soviet Pacific Research Institute for Fisheries and Oceanography (TINRO) are using sonar to track the migration routes of salmon in the Pacific and the Sea of Okhotsk. Sonar also will be used to determine the number of salmon. The scientists say this method enables accurate assessment of the status of the salmon resource, and allows scientific predictions of future catches.

Natural Salmon Reproduction

Kamchatka is first in natural salmon reproduction in the Soviet Far East. The sparsely populated area's many large and small rivers offer ideal conditions for salmon propagation. (TASS, Mar. 25.)

* * *

IMPROVE CULTURE OF FRESHWATER CRUSTACEANS & FISHES

Biologists have developed a method of breeding that has saved crayfish ('Astacus') from extinction in Lithuania. Up to 90 young have been hatched from each female stripped of fertilized eggs. Hatchings 6 to 10 days old are released into ponds in the spring when water temperatures range between 10° and 15° C. (50°-59° F.). This year, hatcheries in east Lithuania will release about half a million into rivers and lakes.

Carp

Acclimatization of silver carp and bighead has progressed well in the Azov-Kuban region. Rice field culture of these species has increased steadily in recent years. ('FAO Fish Culture Bulletin,' vol. 1 (2) Jan. 1969.)

* * *

BUILDS NEW STERN FACTORY TRAWLERS

Baltiia shipyards at Klajpeda is building a modified class of stern factory trawlers (BMRT). The first, 'Luchegorsk,' was launched in early January 1969. She displaces 4,000 tons and can produce 70 metric tons of fish meal and 30 tons of frozen fish a day. Equipped with automatic lines for fish-meal production, her production capacity is triple the regular BMRT's.

Probably Fish Pollock

Luchegorsk was assigned to the Far Eastern Fisheries Administration's Kamchatka fleet. On her way to the Pacific in March, she successfully tested her equipment off Spanish Sahara and the Canary Islands.

The new BMRT probably will be deployed in Soviet Alaska pollock fishery. Alaska pollock is used almost entirely for fish meal.

* * *

NEW UNDERWATER RESEARCH VESSEL TESTED

'Sever-2,' a new Soviet underwater research craft, passed her first (unmanned) test successfully. She was lowered to 2,185 meters (1,000 fathoms) in the Black Sea, off Sevastopol, in Mar. 1969.

The 20-metric-ton craft is equipped with a movable mechanical "hand" modeled after the human hand, several searchlights, and a light outside the hull supported by a special arm. She also carries supersensitive sound recorders, underwater cameras, and instruments to measure chemical composition and physical properties of water.

Physical Characteristics

Not a hydrostat, like 'Sever-1,' she can move at "speed of a running man" (about 5 miles an hour) at depths of 1,000 fathoms. She also can spin around her axis on one spot. The hull is encased in streamlined plexiglass "casing." The searchlights, mechanical "hand," and light protrude outside casing. Living quarters for a 3-man crew are equipped with air-regeneration units, fresh water, thermos containers for hot food, and battery power for underwater stays up to 3 days.

For Research

The craft is expected to be operational by the end of the year. She then will be turned over to Fisheries Ministry for research in North Atlantic and Arctic.

USSR (Contd.):

A specially designed mothership will carry Sever-2 in a hangar alongside, where temperature and moisture will be kept constant. The craft will be used to develop a technique for artificial fish schooling, and to study the reactions of fish to light and sound. ('Pravda,' Mar. 22.)

* * *

COMPUTERIZED MODEL OF WORLD OCEANS PLANNED

Scientists in Leningrad have begun to build a mathematical model of the world oceans. They are using a system of equations that describes the oceans' basic characteristics--horizontal and vertical currents, temperature, and salinity.

In a successful trial, the computer calculated correctly changes in currents off the western shores of the Atlantic and the Pacific. The calculations were confirmed by independent oceanographic observations. It also computed accurately the time needed for currents to develop in relation to wind force and direction.

Being Built at Leningrad

The model is being built by the Leningrad Branch of the Central Institute for Mathematical Economics and the Leningrad Laboratory of the Institute of Oceanology. If successful, it will provide a true "portrait" of the ocean. The scientists believe the model will allow them to determine changes in the velocity of currents without sending out research vessels. (TASS, Mar. 25.)

Note: Soviet research is interesting and exciting. The model's validity will be demonstrated only after years of practical testing. Soviet oceanographers probably have covered more of world oceans than other oceanographers because of large oceanographic research vessels they have received from Poland and East Germany and their own wide-ranging research vessels. A successful model could affect world fisheries and shipping.

* * *

NEW DEVICE DETERMINES SALINITY

Soviet oceanographers used to determine sea-water salinity by taking a sample every 5 to 10 kilometers and determining the most important factors by chemical analysis. They often complained about the lapses in information between time of sampling and when they obtained the results of measurements.

Now the Far Eastern Scientific Research Institute for Geology's Geophysical Laboratory has designed a new device for continuous measurement of water salinity. The device will be tested by vessels from the Institute of Oceanology's Leningrad branch.

Note: U.S. oceanographers have used U.S.-manufactured continuous salinity-measuring devices for several years.

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'VITIAZ' ENDS CRUISE IN EQUATORIAL PACIFIC

The Soviet research vessel 'Vitiaz' has completed her 44th cruise in the equatorial Pacific. Expedition chief M. E. Vinogradov reports the collection of unique quantitative data on biological productivity. For the first time, the growth rate of animals feeding on microscopic algae was determined.

Bacteria were shown to form special agglomerations, important as a food component for small marine animals. Previously, bacterial cells were not considered food because of their miniscule size; to explain their role in plankton, the scientists measured the amount of energy transferred from one food level to another.

Plankton Research

Intensive plankton research was conducted with special nets, bathyphotometers, and radioisotopes to determine photosynthesis intensity. This research yielded for the first time a detailed picture of the vertical distribution of plankton.

Large, stable accumulations of animals, microorganisms, and detritus were discovered at several dozen meters. These perform important functions in the life of the ocean's upper layers.

The collections will be used to design a mathematical model of vital links between marine animals, and to compile a generalized 'biological productivity map' of the ocean. ('Izvestiia,' Feb. 20.)

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THE SUGGESTION BOX PROVES VALUABLE FISHING GEAR

The Soviets have suggestion boxes and know how to use them. The Sevastopol Trawler Fleet Administration received 154 suggestions during first-half 1968; the 118 adopted saved thousands of rubles.

USSR (Contd.):

One suggested a continuous production line for gutting, filleting and packing fish. Installed aboard a BMRT, it saved 50,303 rubles (US$55,300) during one trip. A suggestion that various repairs be performed at sea, without docking, saved 6,168 rubles (US$6,785) per vessel. ('Rybnoe Khosiaistvo,' Feb.)

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VESSEL STUDIES FISHERIES OFF SENEGAL

Soviet scientists on the research vessel 'Blesk' of the Atlantic Research Institute for Fisheries and Oceanography have conducted a joint survey with Senegalese scientists off West Africa. The survey was made to assess the fisheries, and to recommend measures to utilize, conserve, and expand fishery resources.

This was the first joint USSR-Senegalese scientific fisheries exchange. Joint cruises and expanded exchanges of scientific personnel are planned. (TASS, Mar. 16.)

U.S. Groundfish Survey

The Blesk, on her maiden cruise during Sept-Nov. 1968, participated in a joint U.S.-USSR groundfish survey under the Mid-Atlantic Fisheries Agreement. The survey, conducted from BCF's Biological Laboratory at Woods Hole, Mass., covered an area from the Gulf of Maine to Cape Hatteras.

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EXTENDS SEAWEED AGREEMENT WITH JAPAN

On April 14, 1969, after only 3 days of negotiations, the Soviets signed an extension of the "private" seaweed-collection agreement with Japan. The Japan Fisheries Association President (Nakabe) signed for Japan; the Acting Director of Commercial Fishing Division, Ministry of Fisheries (V. Lipanov) for the USSR. The Soviets first concluded this agreement (also known as "kelp agreement") in 1963 at Japan's insistence; they have extended it every 2 years.

The 1969 Agreement

In the past, the Japanese were permitted to deploy 300 seaweed-collecting vessels in the Straits of Nemuro, off northeast Hokkaido, in areas the USSR claims as territorial waters. In 1969, Japanese will be allowed to deploy 330 vessels. Also, each Japanese fisherman will be permitted to catch 10 kilograms of fish daily for his own food. As compensation, the Soviets will require each Japanese vessel to pay a fee of 12,000 yen (US$33) per year.

The fees demanded, about $11,000 a year, are low compared with value of 1963 seaweed harvest estimated by Japanese at US$800,000. (No recent estimates are available.)

Norway

FISHING OUTLOOK IS PROMISING

The short-term outlook for Norway's fishing industry is promising. Total catches of cod and other groundfish in the major fishing districts (Sogn of Fjordane through Finnmark) reached 118,500 metric tons in first-quarter 1969--22% above same period 1968. High-quality spawning cod and Finnmark young cod provided 82,500 tons, a remarkably high proportion of the catch. Continuing good market conditions for frozen fillets were reflected in the more than 40% increase in fish purchases (to 57,000 tons) by the frozen-fillet industry.

Stockfish

There were no prospects for early resumption of stockfish sales to Nigeria, the traditional market for about 70% of Norway's stockfish. But raw fish supplies for hanging (stockfish) increased over 25% to 31,700 tons in first-quarter. This reflected both low prices and demand for salted fish, mainly klippfish, and state purchases and guarantees for stockfish production.

Inventories

On Dec. 31, 1968, stocks on hand of frozen fillets and stockfish were 18,000 tons and 8,400 tons, respectively. Frozen-fillet stocks were about 20% above, and stockfish inventories about 10% below, normal levels.

Norway (Contd.):

Exports of Frozen Fillets to U.S.

Recorded shipments of frozen-fish fillets to the U.S. in Jan.-Feb. 1969 corresponded to over 33,000 tons on annual basis. According to Frionor's sales director, the U.S. frozen fish market is growing at a 10-20% rate.

Industrial Fishery

Reduction plants received about 446,000 tons of raw material during first quarter, slightly more than year before. The complete failure of the winter herring fisheries was offset by a good capelin fishery off Finnmark. Prospects for the rest of 1969 will depend on development of North Sea mackerel and herring fisheries, the small and fat herring fisheries, and a possible reappearance of capelin.

Competition for Fish Meal

Fish meal industry spokesmen have voiced concern over planned EEC subsidization of surplus stocks of dehydrated skimmed milk. Reportedly, such stocks are well above combined Norwegian-Danish annual fish meal sales in EEC area. It is believed that marketing such quantities of dehydrated milk for animal food will result in a cutback in EEC demand for Norwegian fish meal.

The fish meal industry also is concerned about the potential price-lowering effects stemming from construction of central warehouses in Europe by Peru. These warehouses will be supplied by large bulkships. (U.S. Embassy, Oslo, Apr. 25.)

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SUPPORT TO FISHERIES RISING

A major aim of the General Agreement of June 3, 1964, signed by the Ministry of Fisheries and the Norwegian Fishermen's Union, was to end state support to the fisheries in the near future. The steadily increasing subsidies granted since then indicate no progress has been made.

Total state support payments to the industry reached US$37.7 million in 1968. This included $7.8 million for state purchases of stockfish from producers/exporters. State support to the fishermen was 20.4% of 1968 exvessel catch value, compared with 16.8% in 1967.

Norway Criticized

Although the support system includes no direct export subsidies, Norway has been criticized lately, notably by Britain, for keeping export prices artificially low through subsidies.

Norway's support system also makes Denmark's unsubsidized industry wary of the Norwegian demand for a free NORDEC market for fishery products. (U.S. Embassy, Oslo, Apr. 25.)

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1968 FISH BODY OIL OUTPUT FELL

In 1968, raw material supplies for fish meal and oil-reduction plants were about 20% below 1967. Production of fish body oils shrank correspondingly to 240,000 metric tons; 1967 production was 327,000 tons. Production of fish-liver oils increased from 10,500 to 11,000 tons.

Production of Oils from Fish and Marine Animals

Commodity	1967	1968
	(Metric Tons)	
Fish-liver oils	10,500	11,000
Fish-body oils	327,000	240,000
Total fish oils	337,500	251,000
Sperm oil:		
Antarctic	4,523	429
Shore stations	181	9
Total sperm oil	4,704	438
Seal oil	2,300	1,500
Whale oil:		
Antarctic	13,661	5,396
Shore stations	192	468
Total whale oil	13,853	5,864

Pelagic Whaling Stops

Since Norway will no longer participate in Antarctic whaling, the fish off her coast will be the main source of marine oils. Only one Norwegian whaling expedition took part in the 1967/68 season, the last Norwegian pelagic-whaling season. Limited whaling is still carried on from 2 land stations in Norway.

Imports & Exports

Reflecting lowered fish oil production and dimished returns from whaling, fish oil imports increased from 23,022 tons in 1967 to 43,791 tons in 1968. More than one-half came

Norway (Contd.):

from Peru. Exports of fish oils dropped from 190,777 tons in 1967 to 115,726 tons in 1968--about same as 1966.

	1968	1967	1966
	(Metric Tons)		
United Kingdom	39,311	34,819	32,100
Sino-Soviet	22,834	23,161	48,438
Others	24,045	23,645	25,138
Total	86,190	81,625	105,676

Exports of hardened marine oils increased by about 5,000 tons to 86,190 tons as a result of larger shipments to Britain. (Sources: Directorate of Fisheries, Bergen, 'The Norwegian Whaling Gazette,' and Ministry of Fisheries, Oslo--U.S. Embassy, Copenhagen, Apr. 15.)

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INTERNATIONAL CONSERVATION EFFORTS

Norway has not publicized any official policies regarding international efforts to conserve northeast Atlantic fish resources. Indications are, however, that she favors a national quota system for groundfish in the Barents Sea, regulatory measures for North Sea herring and mackerel fishing, and a ban on salmon fishing in international waters. All these issues were on the agenda of the May ICNEAF meeting in London.

Ban on Driftnets

The recently imposed ban on driftnets (gillnets) inside Norwegian fisheries limits reflects government recognition of the need to preserve the North Atlantic salmon stock. Minister of Fisheries Einar Moxnes has said that banning driftnets in domestic waters would give weight to Norway's support of a complete ban on salmon fishing in international waters.

Government's Efforts Backed

The government's salmon conservation efforts are fully supported by marine scientists and salmon fishing interests. Norwegian landowners have had exclusive salmon fishing rights in the rivers and along the seacoast for hundreds of years. Drift-netting dates back only to the beginning of the 1960s. (U.S. Embassy, Oslo, Apr. 25.)

Denmark

FISHERY EXPORTS IN 1968 SET RECORD

Danish exports of fishery products during 1968 were worth a record US$133 million. Compared with 1967, pond-trout exports increased almost 15% in quantity and 11% in value; exports of cod fillets and blocks rose 10% in quantity and 14% in value.

Foreign Markets

Common Market countries continued as the leading market, although Denmark's EFTA partners bought only slightly less. Exports to East Bloc countries increased 25%. Exports to the U.S. were up about 25% over 1967, primarily because of increased sales of cod fillets and blocks.

Faroese Exports

Total fishery exports from the Faroe Islands amounted to $19.2 million in 1968, a 17% decline from 1967. Reductions in sale of salt fish accounted for much of the decline. Exports of frozen fillets and blocks to the U.S. declined 25%, but the U.S. still was the largest buyer. (U.S. Embassy, Copenhagen, May 1.)

Iceland

WHITE FISH CATCHES INCREASE

In 1968, there was greater fishing effort for the more valuable white fish sector--cod, for example. It produced a recovery in the white fish catch; it promises an even greater catch in 1969. This was due partly to fishing vessels and fishermen, previously lured to herring fishing during the boom years, returning to the white fish fishery.

Processing of fish has been directed increasingly to products commanding a higher export value--and to the best market prospects. More profitable use results in larger volume of processed frozen white fish for export, and more labor-intensive methods favorable to employment. The almost complete loss of Iceland's stockfish (air-dried cod) market in Nigeria in the past 2 years cut production and export. So better quality raw material is being shifted into freezing and salting.

Iceland (Contd.):

1969 Outlook

Outlook for herring will not be discernible until early fall. This is because of changed migratory behavior of herring and smaller stocks. White-fish production for 1969 is expected at least at 1968 levels. Despite 6-week strike by fishermen that began Jan. 1969, the major cod-fishing season ending in May was bringing catches above 1968. For the first 3 months of 1969, cod catches increased 38% over 1968. The low-value spring capelin catches were reaching records. By end of March 1969, catches had more than doubled over 1968 period.

The value of export production is yet to be determined by price movements abroad. These appear favorable. Supply conditions in the U.S., particularly for frozen fish, may well determine trends. The U.S. is Iceland's leading market, followed by Great Britain and USSR in 1968. Salt-fish markets are shrinking. (U.S. Embassy, Reykjavik, May 8.)

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CAPELIN MEAL SELLING WELL

In 1965, when Icelanders started catching capelin on a large scale, exporters had trouble selling capelin meal to certain countries. Some buyers did not know capelin. Capelin meal, being more fatty than herring and cod meals, does not sell as well. Despite occasional sales difficulties, capelin meal usually sold at fair prices in 1965-1968.

Production & Prices in 1969

The initial problems were largely overcome in 1969, and sales have been excellent. They have been helped by the recently favorable market for fish meal. Iceland's 1969 capelin meal production will be about 25,000 tons, and average c.i.f. prices about IKr. 13,650 a ton.

Capelin Meal Exports & Average Prices

	Exports	Average f.o.b. Price
	Metric Tons	IKr./Metric Ton
1968	11,243	6,360
1967	15,756	6,070
1966	19,185	6,480
1965	6,480	6,620

Note: IKr. 57.07 = US$1 in 1968, IKr. 43.06 = US$1 in 1967, 1966, and 1965.

Polish Purchases

The Poles have been large buyers of herring and cod meals in recent years. Efforts to get them to buy capelin meal were in vain until recently--when a Polish feed-blending specialist visited. Then Icelanders succeeded in selling Poland a 250-ton sample shipment of capelin meal at acceptable prices.

Largest Buyer Is Denmark

The Danes have purchased the lion's share of this year's capelin meal production, both for domestic use and for reexport. They have a more favorable sales position than the Icelanders. They do not have to pay a 10% import duty on fish and capelin meal in Britain because of Denmark's EFTA membership. (U.S. Embassy, Copenhagen, May.)

Sweden

AMERICAN CRAYFISH WILL BE PLANTED IN LAKES

The Swedish Fisheries Directorate has announced a US$40,000 appropriation to introduce American "signal" crayfish into 60 lakes. It is an attempt to replace Swedish stocks of the European river crayfish (Potamobius astacus). These stocks had been decimated by a virulent fungus disease that first struck in 1907.

Successfully Tested

The American "signal" crayfish, imported for testing from Lake Tahoe in Nevada and California, proved easily transplantable under Swedish conditions. It is said to be a thousand times more resistant to the fungus disease than the river crayfish. The "signal" crayfish is aggressive, reproduces rapidly, and may compete effectively enough to reduce river crayfish stocks even further. Therefore, introductions will be made under closely controlled conditions. The lakes selected for planting have at least 20 acres of surface area and had sustained good stocks of river crayfish before the disease struck.

A Delicacy in Northern Europe

The Swedes and other North Europeans relish fresh-water crayfish, eating them with

Sweden (Contd.):

aquavit (1 tiny glass with each claw and 2 with the tail). Taste tests, presumably under standard conditions for crayfish eating, have shown that American "signal" crayfish has a flavor equal to the native variety.

Market Opportunities

The commercial market for crayfish in Sweden and Denmark lasts only a short period. It exists primarily during August, when many people are on vacation. Many crayfish consumed in Sweden and Denmark are imported from Turkey and Bulgaria. The U.S. Embassy in Copenhagen has received occasional inquiries regarding U.S. suppliers of fresh live crayfish.

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LICENSES SHRIMP IMPORTS

The Swedish Agricultural Marketing Board decided that all cooked-shrimp imports were subject to license approval, effective March 1, 1969. The decision was made to give the Board an opportunity to follow the level of imports and price development.

Requiring a license for imports does not mean automatic limitation. Imports will be readily licensed unless the level of imports and prices become problems. The license procedure will give the Board a chance to step in rapidly if import limitation is considered necessary.

Addition of coloring to shrimp imports also will be prohibited, effective July 1, 1969. (U.S. Embassy, Mar. 3.)

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EXTENDS DEADLINE
ON COLORING SHRIMP

Sweden will permit coloring of shrimp until Jan. 1, 1970. Previous deadline was July 1, 1969.

After Jan. 1, 1970, coloring will be prohibited except for peeled and deep-frozen shrimp packed in closed original containers. The label must contain a statement that shrimp have been colored. (U.S. Embassy, Stockholm, Apr. 29.)

Spain

1968 WAS GOOD YEAR FOR
CANNED FISH INDUSTRY

Fish canning, one of the more important sectors of Spain's food industry, has resumed its growth. It had experienced a sharp reduction in output in 1966 after a peak in 1965. The value of fish canning in 1968 surpassed 1965's high.

The industry produces primarily canned fish packed in oil, about 70% of output, and canned marinated fish, about 10%. Production centers are in the 4 northwest provinces that form Galicia. The more important canners operate in and around Vigo in Pontevedra province.

World Market

Of equal significance is the canned fish industry's performance in the international market. Exports in 1968 grew to about US$18 million, a 27% increase over 1967. Canned sardine and anchovy sales are the largest share (about 64%) of exports. Tuna, bonito, and albacore are next largest.

Resumed expansion in domestic and export markets points to possibility of increasing opportunities for U.S. manufacturers of processing and packaging equipment for domestic producers. (U.S. Embassy, Madrid, May 7.)

United Kingdom

1968 FISH MEAL USE
ROSE 100,000 TONS

Fish meal consumption in the U.K. last year increased by more than 100,000 tons over 1967 to a record 582,000 long tons. Domestic meal production, boosted by larger amounts of unsold fish in Hull and Grimsby, rose 7,000 tons above 1967, to 87,000 tons.

Imports

The rest of the supply--495,000 tons worth US$70.3 million--was imported ($54.7 million for 395,450 tons in 1967 and $50.8 million for 308,500 tons in 1966). Total supply in 1967 was 475,450 tons; in 1966, 394,500 tons.

United Kingdom (Contd.):

Fish Oil

In 1968, fish oil imports dropped from 281,900 tons worth $36 million in 1967 to 265,000 tons valued at $28.1 million. In 1966, oil imports of 177,800 cost $29 million.

On a yield basis of 4 to 5 tons of fish for a ton of meal, British imports represented a catch of over 2 million tons. ('Fishing News,' Mar. 7.)

East Germany

CONDUCTS OCEANOGRAPHIC RESEARCH IN BALTIC

Early in March 1969, East Germany's oceanographic research vessel 'Prof. Albrecht Penck' sailed on the first of 4 Baltic research voyages scheduled for this year. This is part of the program for International Baltic Sea Year 1969-70. It is being carried out by the Institute of Oceanography of the East German Academy of Sciences. The research is financed in part by the East German High-Seas Fisheries Administration.

Research Procedures

Measurements and chemical-biological samples will be taken at 14 locations. The sea's temperature, salt content, water density, and "production potential" will be measured. According to a 1968 agreement, the participants will exchange data to lay the groundwork for development of fishing in the Baltic.

Increasing Pollution

Another research objective is to develop methods of fighting pollution. Recent observations by the East German Institute of Oceanography at Rostock-Warnemuende have disclosed that pollution of the Baltic due to more organic matter has increased over the last decade. This matter is soaking up dissolved oxygen and threatening marine life. (U.S. Mission, Berlin, Mar. 18.)

Czechoslovakia

IMPROVES FISH-CULTURE TECHNIQUES

The Department of Fish Culture and Hydrobiology, University of Brno at Bano, has increased fingerling production from 200-500 kilos/hectare to about 1,000-1,200 kilos per hectare by improved culture techniques. Attempts are being made to increase production of table fish to 1,500 kilos/hectare by judicious fertilization of the ponds, and an optimum ratio of natural and artificial feeding. ('FAO Fish Culture Bulletin,' vol. 1, no. 2, Jan.)

Poland

FISH CULTURE IS GROWING

Salmonid culture is expanding in Poland, particularly the pond culture of rainbow trout, Salmo gairdneri. Atlantic salmon, Salmo salar, were introduced into rivers in April 1968. Eyed eggs of this species came from Canada.

Poland's annual harvest of common carp from ponds is about 12,300 metric tons. Total inland fishery production is 20,600 tons. Common carp is selected systematically for fast growth rate and delayed maturation.

Carp Culture

Monoculture of common carp is widely practiced, but other species--like tench and grass carp--are being stocked increasingly to achieve higher yields. Based on experiments conducted by the Inland Fisheries Institute at Zabieniec, commercial culture of grass carp, silver carp, and common carp is recommended. ('FAO Fish Culture Bulletin,' vol. 1 (2), Jan. 1969.)

* * *

Economic Returns to Polish Factory Trawlers in Northwest Atlantic

Bruno G. Noetzel

The Northwest Atlantic has the world's richest resources of food fish; it is also the most exploited part of the ocean. Fishing effort increases year after year. The pressure has accelerated with introduction of new fishing techniques--and transfer of fish-processing activities from land to fishing grounds via factory ships.

Large fleets of modern stern-ramp trawlers operate year round. The vessels are equipped with highly mechanized fish-processing facilities: freezing, fish meal, and fish oil plants, and refrigerated holds for frozen products. They are capable of converting the entire catch into final marketable products: frozen fillets in blocks, fish meal, and fish oil.

These huge fishing and processing vessels, built entirely with state funds, are representative of the direction of fishery development in most of the Eastern European countries in the past 10 years.

What the Vessels Look Like

On Oct. 22, 1960, the Gdansk Shipyard delivered the first in a series of these modern fishing vessels to Poland's state-owned fishing industry. By the end of 1965, twelve factory trawlers of the type described below were in operation, all managed by "Dalmor" Deep-Sea Fishing Enterprise in Gdynia.

The all-welded, steel-hull vessels have these main characteristics: length overall 85.20 m, moulded breadth 13.80 m, depth to shelter deck 9.75 m, gross tonnage 2,800, net tonnage 1,160. A Sulzer-Zgoda model 8TD48 diesel engine developing 2,400 h.p. at 180 r.p.m., is coupled to a 4-bladed 3.10 m diameter Lips controllable pitch propeller to give a cruising speed of 11.5 knots.

Auxiliary machinery includes four 250 kW generators driven by Sulzer 6BAH22 diesels, each 375 h.p. at 500 r.p.m. The standard crew is 94 men, but there are accommodations for 102. The vessels can stay at sea 70 days without refueling.

The processing plant is equipped with filleting machines for redfish (Baader 150) and for cod (Baader 99, and on a few vessels a Baader 38 also), heading machines (Baader 412), skinning machines (Baader 46 and 47), and washing machines (Baader 666). There are two filleting lines (on some vessels there is an additional line for small cod), and 9 stands for filleting by hand (for larger fish). The total capacity of the processing plant is 50 m. tons of fish every 24 hours.

Fish fillets, dressed fish, and whole fish are quick frozen in 2 blast freezers with a total capacity of 30 m. tons of products per 24 hours. The frozen fish blocks are stowed in 3 refrigerated holds (total volume 1,433 cubic meters). The fish meal plant can handle 20-30 m. tons of offals and by-catch per 24 hours. Fish meal packed in 50 kg. sacks is stowed in a 285 cubic m. hold (the storage capacity is 600-650 kg./cu.m).

Up to one ton of liver oil can be produced daily from cod livers. Fish oil is also obtained as a by-product of fish meal production. Four tanks with a total volume of 58 cubic m. provide storage space for the oils (approximately 53 m. tons of oil).

How They Are Operated

During the 5-year period 1961-1965, these vessels made 75 trips (a total of 27.75 vessel-years were analyzed) to the Northwest Atlantic fishing grounds (International Commission for the Northwest Atlantic Fisheries

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Note: Tables 1 and 2 and figure 6 are in the appendix in reprint (Sep. No. 842) of this article. For a free copy of the Separate, write to Division of Publications, U.S. Department of the Interior, Fish and Wildlife Service, BCF, 1801 N. Moore St., Arlington, Va., 22209.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 842

(ICNAF) Convention Area) and only 2 exploratory trips to the African shelf.

On the average, a vessel was at sea 270 days per year; the balance in ports and shipyards. The vessels spent an average 16½ days in domestic ports between trips.

Running to and from the fishing grounds required 23.5% of time at sea, or 17.4% of a year's time (Figure 1). On the fishing grounds, about 75% of the time was used for fishing activity, including: setting and hauling of trawl, trawling, and gear repairs (Figure 2).[1/]

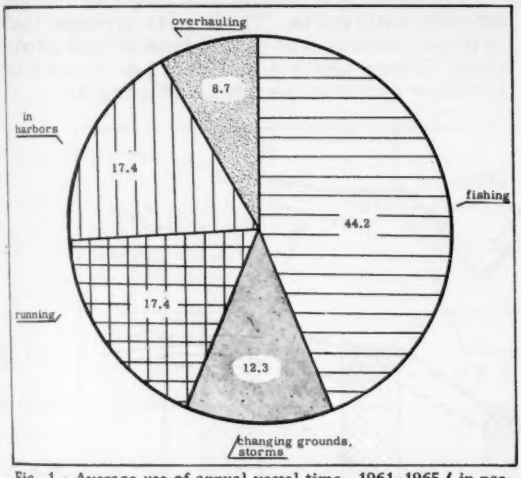


Fig. 1 - Average use of annual vessel time, 1961-1965 (in percent of a year's time).

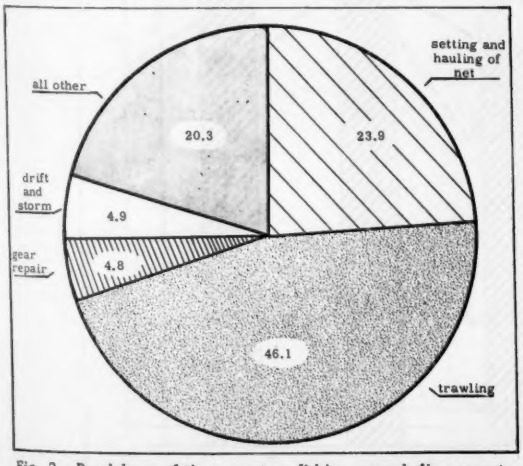


Fig. 2 - Breakdown of time spent on fishing grounds (in percent, 5-year averages).

Because of the long distance between home ports and grounds fished, the vessels were able to complete an average of only 2.77 trips a year. The average fishing activity per trip was 58 days (one day = 24 hours of fishing activity). The vessels averaged 496 hauls and 860 hours of trawling during the 58 days.

On 2 trips to the African grounds, 4,355.3 m. tons of fish were caught (or 2,178 m. tons per trip). The average catch from 75 trips to the ICNAF area was 1,676.5 m. tons.

The production of these factory trawlers may be looked at from 2 viewpoints: What is this production relative to total landings by the entire Polish fishing fleet? What are the effects of this additional fishing pressure on the resources in the ICNAF Convention Area?

In 1965, the Polish fleet represented 11 vessel-years of operations--10 vessels were operated all year, and 2 joined fleet during year. This fleet caught 52.2 thousand m. tons of fish in the ICNAF area. It accounted for 18.6% of total landings by entire Polish fishing industry. This quantity is a significant portion of Polish landings, but it is only 1.6% of 1965 landings by all countries in ICNAF area.

Over the 1961-1965 period, the catch by Polish factory trawlers from ICNAF area (125.7 thousand m. tons) was 0.9% of all landings.

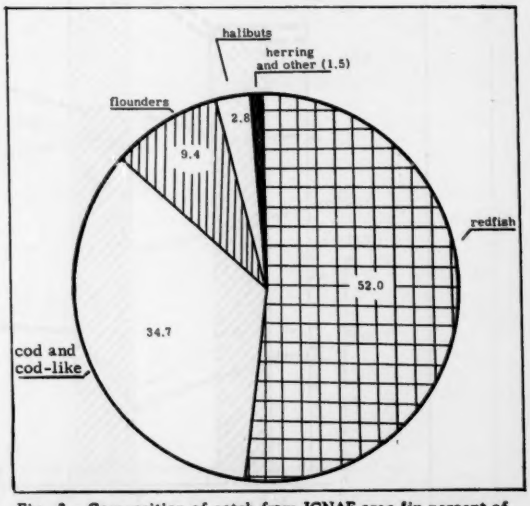


Fig. 3 - Composition of catch from ICNAF area (in percent of total).

1/"All other" in Figure 2 includes: changing grounds, short calls to foreign ports (without time for unloading or repairs), running to and from these ports (mainly St. John's, Newfoundland).

The composition of catch from ICNAF area is shown in Figure 3. The total catch of 130,095 m. tons (5 years' production, Africa and ICNAF area combined) was processed aboard vessels into 68,959 m. tons of fish products. From ICNAF area alone, 66,402 m. tons of fish products were landed in these forms:

	Percent of Total by Weight		
Frozen redfish fillets	23.46		
frozen cod fillets	15.55		
Total frozen fillets		39.01	
Frozen fish, dressed		34.13	
Frozen fish, gutted		0.05	
Frozen fish, whole		1.99	
Other frozen products		0.15	
Total frozen products			75.33
Fish meal			20.03
Fish oils			4.64
Total landings			100.00

About 10% of total production was landed in foreign ports. These landings consisted of:

6,066.1 m. tons of frozen products
550.1 m. tons of fish meal
11.1 m. tons of fish oils

Out of these quantities 1,618.7 m. tons of frozen products were landed in Africa, the remainder in Canada.

The balance of total production was brought into domestic ports. The 5-year average load in those landings was 853 m. tons of fish products. There was a significant increase in landings per trip over time (Figure 4).

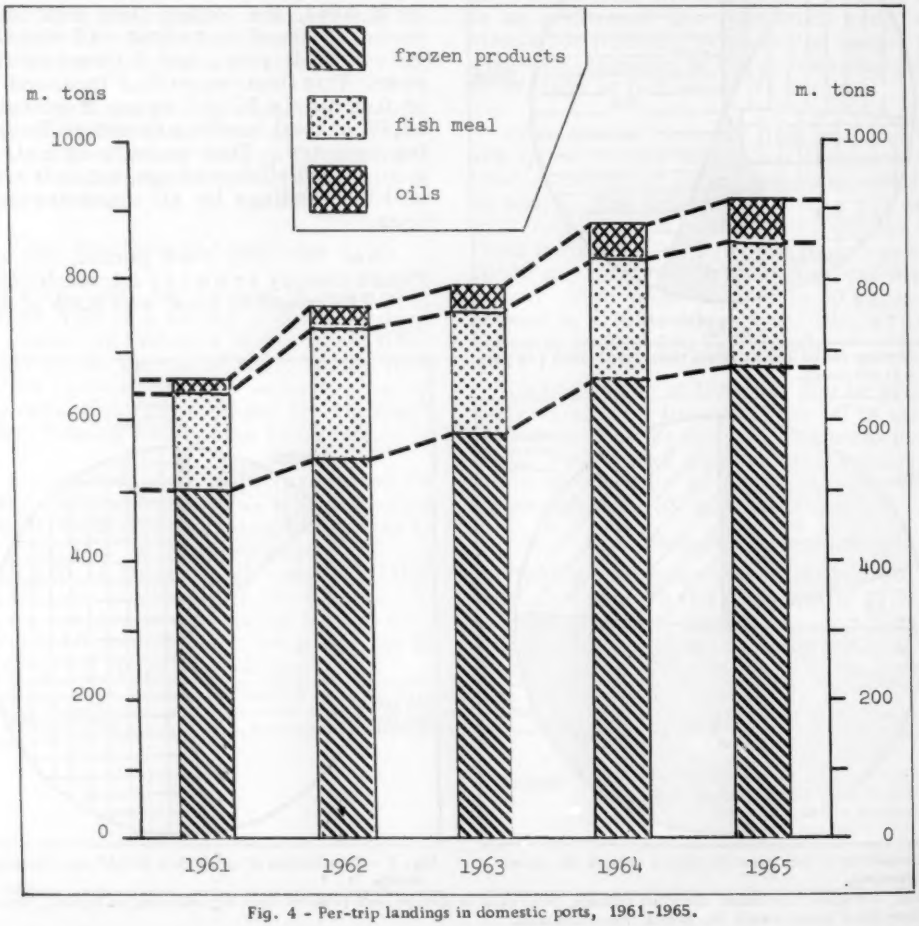


Fig. 4 - Per-trip landings in domestic ports, 1961-1965.

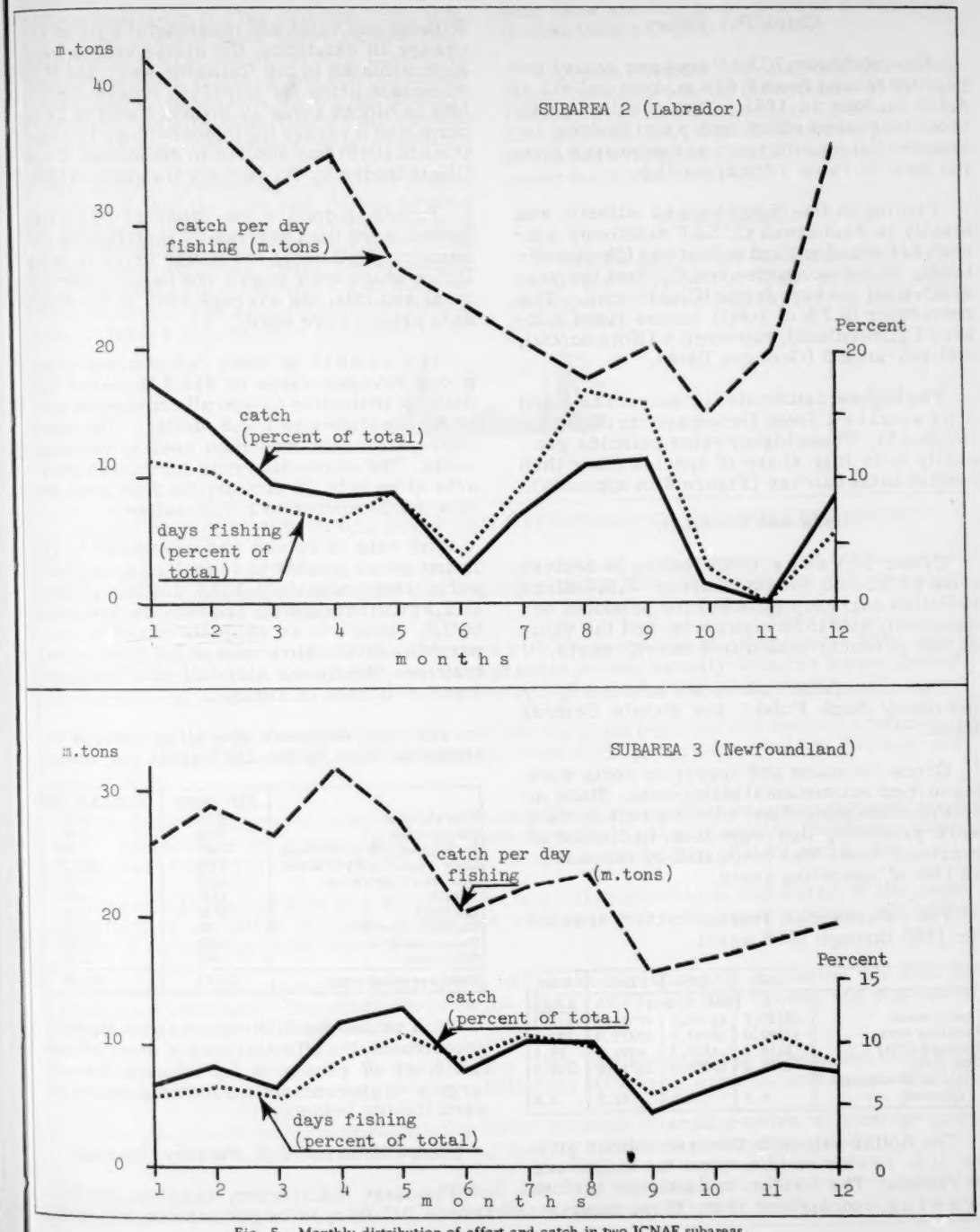


Fig. 5 - Monthly distribution of effort and catch in two ICNAF subareas.

Catch Per Effort

The catch from ICNAF area per vessel and year increased from 2,669 m. tons in 1961 to 4,748 m. tons in 1965. This resulted partly from increased effort and partly from increased fishing efficiency as can be seen from the data in Table 1 (in appendix).

Fishing in the Northwest Atlantic was mainly in 2 subareas (ICNAF notation): sub-area 2 (Labrador), and sub-area 3 (Newfoundland). These accounted for 97.3% of the vessels' total catch from ICNAF area. The remainder (2.7% of total) comes from sub-area 1 (Greenland), sub-area 4 (Nova Scotia), and sub-area 5 (Georges Bank).

The highest catch rates in sub-areas 2 and 3 prevailed from December through May (Figure 5). These higher rates coincide generally with high share of species other than redfish in the catches (Figure 6 in appendix).

Costs and Earnings

Gross revenue from fishing is derived from 2 sources: the equivalent of U.S. dollars in Polish currency (zloties) for products occasionally sold in foreign ports; and the value of fish products landed in domestic ports.

The conversion rate is set arbitrarily by Narodowy Bank Polski, the State's Central Bank.

Gross revenues and operating costs were taken from accountants' statements. Since no data on management and administration costs were provided, this cost item (indicated as overhead cost) was estimated by the author as 15% of operating costs.

The returns of an average factory trawler for 1963 through 1965 were:

	1963	1964	1965	1965
	. . . . (1000 zloties)			$1000
Gross revenue	45480.2	48344.7	47376.6	853.3
Operating costs	34392.0	32645.0	29273.0	527.4
Overhead (15%)	5158.8	4869.8	4391.0	79.1
Gross profit	5929.4	10829.9	13712.6	246.8
Return on investment (percent)	5.5	10.0	12.7	8.8

The dollar values in the last column give the U.S. reader an idea about the magnitude of values. The reader is cautioned against drawing conclusions from these figures. Without any valid and meaningful rate of exchange in existence, the dollar values were approximated in the following way: the U.S. wholesale price for imported frozen cod fillets in blocks (over 10 pounds each) at 24.4¢ per pound (average for imports from 12 countries in 1965) was applied to quantities of cod fillets landed by the factory trawlers in 1965.

Prices in dollars for other frozen fish landed were then derived by maintaining the same proportions to cod fillets price in price list on which crew wages are based. For fish meal and oils, the average 1965 U.S. wholesale prices were used.

The result of these calculations is the gross revenue value of 853.3 thousand U.S. dollars, indicating an overall conversion rate of 55.50 zloties to 1 U.S. dollar. The same conversion rate was then used to calculate costs. The conversion rate for frozen products alone is 54.10 zloties; for fish meal and oils, 64.50 zloties to 1 U.S. dollar.

The rate of return was calculated by relating gross profits to vessel's replacement value--approximately 107.7 million zloties, or 2.8 million dollars. The replacement value in U.S. dollars is an estimate based on comparable construction costs of the U.S. factory trawlers 'Seafreeze Atlantic' and 'Seafreeze Pacific' if built in Europe.

The composition of operating costs is exemplified here by the 1965 costs per vessel:

	1000 zloties	Percent of Total
Fuel and oils	4543	15.52
Fishing gear	3908	13.35
Packing and other materials	2467	8.43
Crew wages & payroll taxes	8309	28.38
Groceries & provisions	1835	6.27
Repairs	1310	4.48
Insurance	1219	4.16
Harbor & other fees	87	0.30
Depreciation	5003	17.09
Other costs	592	2.02
Total operating costs	29273	100.00

With prices for fish products fixed by government, the effectiveness of invested capital (rate of return on investment) depends largely on government's economic policy toward fishing industry.

Competition for U.S. Factory Trawler

The first U.S. factory trawler, the Seafreeze Atlantic, is on her maiden trip to the

Northwest Atlantic fishing grounds. The U.S. and Polish vessels have many similar features (Table 2 in appendix). A long time span divides the first trials of the European and U.S. fishermen in modern fishing technology. Experience has to be gained before full results of fishing with the new vessel can be expected.

The setup of processing machinery (Table 2) indicates that the U.S. and Polish vessels are designed to exploit the same species (cod and redfish stocks). The experience of Polish factory trawlers gives cause for optimism about the eventual achievements of the Seafreeze Atlantic. The proximity to the fishing grounds favors U.S. vessels in reduced running time and higher proportion of effective fishing time per year.

A broader report on Polish fishing vessels is in: "A Report on the Economics of Polish Factory Trawlers and Freezer Trawlers," by Bruno G. Noetzel. It is based on data provided by the Sea Fisheries Institute, Gdynia, Poland, under a contract with BCF.

Acknowledgments

I thank Dr. Adam A. Sokoloski and Dr. Frederick W. Bell for their valuable comments, and Frank Murray for preparing the graphs.

WHAT IS THE DIFFERENCE BETWEEN HYDROGRAPHY AND OCEANOGRAPHY?

To explain the difference between hydrography and oceanography, the ocean can be compared to a bucket of water; then hydrography is the study of the bucket and oceanography is the study of the water.

Hydrographers are primarily concerned with the problems of navigation. They chart coast lines and bottom topography. A hydrographic survey usually includes measurement of magnetic declination and dip, tides, currents, and meteorological elements.

Oceanography is concerned with the application of all physical and natural sciences to the sea. It includes the disciplines of physics, chemistry, geography, geology, biology, and meteorology.

Physical oceanography is primarily concerned with energy transmission through ocean water, specifically with such items as wave formation and propagation, currents, tides, energy exchange between ocean and atmosphere, and penetration of light and sound.

Chemical oceanography is a study of the chemical properties of sea water, of the cause and effect of variation of these properties with time and from place to place, and of the means of measuring these properties.

Biological oceanography is the study of the interrelationship of marine life with its oceanic environment. The study includes the distribution, life cycles, and population fluctuations of marine organisms.

Geological oceanography deals with the floor and shore of the oceans and embraces such subjects as submarine topography, geological structure, erosion, and sedimentation.

The interrelationship of specialties is one of the main characteristics of oceanography. Oceanographic and hydrographic surveying may be combined on the same ship.

Many times the words "oceanography" and "hydrography" are used interchangeably. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

LATIN AMERICA

Peru

ANCHOVY SEASON CATCH LIMITS AND CLOSURE ANNOUNCED

In mid-April, Peru announced a 9.5 million-metric-ton limit on anchovy catch for the 1968/69 season. The season began Sept. 1, 1968. This is the same limit as in the 1967/68 season; it is 1.3 million tons more than the 8.2 million ton provisional catch announced in January.

Closure Dates

On May 13, the Minister of Agriculture announced that the 1968/69 season would close May 31. By then, the 9.5 million quota was expected to be reached. Fishing will remain closed for 90 days, except for southern ports of Ilo and Mollendo. The 1967/68 season had closed at the same time and for the same period.

Previous Suspensions

The 1967/68 season did not begin until October 1967. A strike had prevented fishing in September. Fishing was suspended Feb. 17-Mar. 17, 1968, and again during Feb. 1969.

Production and Exports

This season's fish meal production through February was 1,113,196 tons; it was 1,211,114 tons for same period 1967/68. March production was apparently the highest of any month in the history of the fishery. Exports continued high compared to previous years, but stocks on hand were below previous levels. On April 24, prices for fish meal c. & f. Hamburg had reached US$159 a metric ton (deliveries through Dec. 1969).

Fish Meal Production and Exports, First Quarter, 1967-1969

	1969	1968	1967
	(Metric Tons)		
Production:			
Jan.	240,495	284,021	287,466
Feb.	17,357	191,575	109,644
Mar.	325,549	155,233	163,512
Total	583,401	630,829	560,622
Exports:			
Jan.	140,283	192,056	100,281
Feb.	185,938	188,222	115,673
Mar.	188,225	170,107	117,282
Total	514,446	550,385	333,236
Stocks on hand Mar. 31	449,652	671,323	596,275

Although production is somewhat unpredictable, April will be a record for that month if the catch of the first two weeks is an indicator. Whether the 9.5 million ton limit will be observed or increased is uncertain. (U.S. Embassy, Lima; 'Sociedad Nacional de Pesqueria,' Apr. 21 & 22.)

Cuba

RECEIVES SHRIMP TRAWLERS FROM EUROPE

Cuba has received 74 shrimp trawlers of the 90 ordered from Spain. The remaining 16 should be delivered during the coming months. The vessels are being built by a consortium of 6 Spanish shipyards, most at Vigo.

The steel-hulled 107-gross-ton trawlers are 23 meters (77 feet) long overall, can travel 10 knots, and carry a crew of 11. Their fuel tanks hold 40 metric tons and the water tanks hold 15. The nonrefrigerated holds are about 80-cubic-meter capacity each.

30 Ordered from France

Cuba has ordered thirty 25-meter-long (82 ft.) refrigerated vessels from France. They will have a 50-ton frozen storage capacity and brine tanks to preserve 4,000 pounds of shrimp. Cuba may pay with spiny lobster sales. During the last quarter of 1968, France imported 540 metric tons of Cuban crustaceans, mostly spiny lobster, worth US$1.45 million.

ASIA

Third Asian Tuna Conference Held

The third Asian tuna conference was held in Seoul, S. Korea, April 22-23, 1969. It was attended by representatives from Japan, S. Korea, Taiwan, and Okinawa.

The conference covered problems in tuna production, sales and marketing, labor, and administration. The discussions showed growing interest in resource problems. The participants talked less about national interests and more about achieving common goals. Ways were sought to insure stable management and fishery growth.

Agreements Reached

Agreement was reached on the following:

(1) The delegates affirmed the need to give due consideration to the tuna resource problem. The delegates will urge their governments to arrange a meeting of fishery scientists--and to promote national participation in International Convention for the Conservation of Atlantic Tunas and other international tuna organizations.

(2) Despite rising costs of fishing vessels, labor, interest rates, and worldwide decline in catch rate, world tuna prices remain low. This poses a serious management problem. Tuna producers must cooperate to assure recovery of production costs and reasonable profits. They must see that a rational price determination is made.

(3) Unilateral extension of territorial waters or fishery jurisdiction over vast areas must be firmly opposed.

(4) A permanent organization, unanimously approved at this year's meeting, will be established.

The next conference will be held on Okinawa in late Feb. 1970. ('Katsuo-maguro Tsushin,' Apr. 28.)

Japan

REGULATES EASTERN PACIFIC YELLOWFIN TUNA FISHERY

The Japanese Fisheries Agency, in accordance with the Inter-American Tropical Tuna Commission's closure of the eastern Pacific yellowfin tuna fishery on Apr. 16, 1969, issued the following instructions:

1) For 1969 only, longliners under 430 gross tons (carrying capacity 300 tons) and purse seiners will be able to fish freely for yellowfin on and after April 16 until combined yellowfin catch after closure reaches the 4,000 short tons allowed Japan. After 4,000 tons, vessels will limit yellowfin catch to 15% of total catch of such vessels.

2) Tuna longliners over 430 gross tons fishing in the regulatory area on or after April 16 would limit yellowfin catch to 15% of total catch of such vessels. ('Katsuo-maguro Tsushin,' Apr. 15.)

* * *

1969 SALMON QUOTA IS 105,000 TONS

The 14th annual meeting of the Japan-USSR Fisheries Commission in Tokyo, April 2-29, set the 1969 Japanese salmon catch quota in Convention waters at 105,000 metric tons. This is 3,000 tons less than in 1967, the previous good year for Asian pink salmon runs; it is the lowest for a good pink salmon year. Of total, 49,750 tons were allocated for Area A (north of 45° N. latitude) and 55,250 tons for Area B (south of 45° N. latitude).

The Soviet coastal quota was set at 80,000 tons.

Much Talk About Herring

At first, the Soviet negotiators sought entry of Soviet patrol boats into Area B and establishment of a "no-fishing zone" between Areas A and B as in 1968. They withdrew demand after strong opposition from Japanese.

The subject of herring fishing was most troublesome; it took up 70% of talks. Both parties agreed to designate "no-fishing zones" in certain areas of Karagin Bay and

Japan (Contd.):

Gizhiga Bay on the eastern and western sides of Kamchatka Peninsula. Japan also agreed to reduce herring fleet to 98 boats (about $\frac{1}{3}$ 1968 fleet) off Karaginski Island, east of Kamchatka Peninsula. ('Suisan Keizai Shimbun,' May 1; 'Nihon Suisan Shimbun,' May 2.)

* * *

REPORT ON DISTANT-WATER TUNA FISHING

In early April 1969, the Japanese tuna fisheries in all oceans, other than eastern Pacific, were generally poor. Catch rates were down for albacore, yellowfin, and bluefin. Up to early April, light catches had caused frozen-tuna prices to rise an average $10-15 a ton on export market. Frozen round albacore exports to the U.S. were around c. & f. US$535 a short ton for direct shipment, and c. & f. US$492 a ton for Atlantic transshipment. Gilled-and-gutted yellowfin exports to the U.S. were quoted at around c. & f. $435.

Pacific Ocean

In the regulatory area of the eastern tropical Pacific, Japanese longliners had been making very good catches of big-eyed marlin and tunas early in March. Catches had averaged 3 tons a day per vessel. Some vessels landed as much as 4 tons per operation.

In the South Pacific, around 10°-15° S. latitude, near American Samoa, yellowfin fishing was good in March. South Korean longliners were catching around 2 tons per vessel, and Japanese vessels close to 3 tons per vessel per day.

In the Tasman Sea, off southeast Australia, modern Japanese vessels concentrated on Australian bluefin fishing. But catches were poor, averaging under 1 ton a day per vessel. There seem to be definite indications of overfishing in the area.

Indian Ocean

Off Fremantle, Australia, fishing had slowed; only a few vessels were there. Longliners had begun converging off the Sunda Islands, Indonesia, to fish yellowfin, big-eyed, and Indian bluefin. Fishing was poor; vessels averaged 1-$1\frac{1}{2}$ tons.

In the Arabian Sea, good yellowfin catches of 3-4 tons a day were being made until mid-March. Fleet operations increased later and landings were cut sharply.

In the western Indian Ocean, north of Madagascar, yellowfin fishing was very slow. The albacore fishery south of the island had not developed fully. Japanese vessels fishing albacore were hoping for a good season starting in late May. However, because of widespread reports of possible current changes in the Indian Ocean, the predominant view was that the fishery does not look promising this year. Most vessels fishing there were catching less than 1 ton a day.

Atlantic Ocean

Around Bermuda, some vessels were fishing with fair success, catching $2\frac{1}{2}$-3 tons of tuna (mostly albacore) per day. West of the Azores, some vessels were catching 2-$2\frac{1}{2}$ tons of albacore per day.

In the Guinea Gulf, the yellowfin season was under way, but fishing was slow. Many vessels were landing under 2 tons per set. Off Angola, longliners were taking 1-$1\frac{1}{2}$ tons of albacore per vessel per day, but fish quality was far poorer than last year. ('Suisan Tsushin,' Apr. 9.)

* * *

TUNA SEINERS DOING POORLY IN E. PACIFIC

The 4 Japanese purse seiners fishing in the eastern Pacific yellowfin tuna regulatory area for over 2 months are doing poorly. Their catch as of April 10 was only about 200 tons. In view of the good performance of U.S. seiners, Japanese opinion is that there is no reason why their fishermen cannot take more fish. Some observers attribute the poor fishing to extremely slow detection of schools.

Better Communications Needed

Until last year, Japanese longliners in the eastern Pacific intercepted messages between U.S. seiners. This helped produce better catches. This year, interception has become impossible because U.S. seiners have changed messages in reporting fishing conditions due to Japanese entry into regulatory area. Therefore, even longliners are not

Japan (Contd.):

making good yellowfin catches. For longliners and seiners to improve fishing efficiency, they must establish better communications. ('Minato Shimbun,' Apr. 24.)

* * *

NEW BOAT-CARRYING TUNA MOTHERSHIP IS IN EASTERN PACIFIC

The new portable-boat-carrying tuna mothership 'Zenko Maru No. 18' (965 gross tons), owned by Ozu Fish Products Co., Misaki, Japan, departed Misaki April 28 for the eastern Pacific.

The vessel has overhead hanger-type refrigerated holds. Equipped with labor-saving devices, it requires only 48 men, compared with over 60 in a similar-sized vessel now operating.

May Indicate Trend

The Zenko Maru is designed to operate out of Japan or an overseas base, depending on where catch would bring higher price. Its construction for longline fishing indicates a possible direction industry may take in the future. For that reason, its performance will be closely watched in Japan until it returns in November. ('Suisan Keizai Shimbun,' May 2.)

* * *

SUMMER ALBACORE TUNA FISHING PICKS UP

The pole-and-line summer albacore fishery was showing signs of improvement. Landings at Yaizu have increased. Until Apr. 20, 5-6 vessels were bringing back only 50 metric tons of pole-caught albacore a day; on Apr. 21 and 22, over 200 tons were unloaded. The fishing grounds are within 12 to 13 hours of port.

Pole-and-line vessels are mostly 39-gross-ton craft. Exvessel price for pole-caught albacore was around US$479 a short ton. ('Suisan Keizai,' Apr. 25.)

* * *

SOUTHERN BLUEFIN TUNA CATCH DROPS

Japanese longliners began fishing for southern bluefin tuna off Australia about 2½ years ago. They harvested 30,000-40,000 tons annually until late 1968. Since then, landings have fallen off sharply. In March 1969, catch per vessel was down to around 0.7 ton a day, compared with 3 tons before.

Restrictions Urged

The Far Seas Fisheries Research Laboratory, Japanese Fisheries Agency, attributes the fall-off to fishing egg-bearing adults during spawning season. Spawning occurs off southern and western Australia from Oct. through Feb. The laboratory explained the bluefin grounds can be sufficiently rehabilitated if fishing is diverted to another area. Therefore, the Agency is urging fishermen to carry out voluntary catch restrictions as soon as possible. ('Shin Suisan Shimbun Sokuho,' Mar. 8.)

* * *

FROZEN TUNA EXPORTS TO U.S. ARE SLOW

In early Mar. 1969, direct exports of frozen tuna to the U.S. were slow because of good yellowfin fishing by California fishermen. Some Japanese trading firms were shipping limited quantities of frozen gilled-and-gutted yellowfin to U.S. west coast packers priced around US$420 c.i.f. a short ton. Prices for frozen round albacore exports to the west coast, unchanged for several months, were quoted at $515 a short ton. ('Katsuo-maguro Tsushin,' Mar. 5.)

* * *

BRAND PROMOTION PUSHED IN ADVERTISING CANNED TUNA IN U.S.

The Japan External Trade Organization's (JETRO) Fishery and Agriculture Division senior analyst has returned to Japan after 5 years in New York. He has advised Japanese firms to combine brand promotion in their joint canned tuna advertising in the U.S.

Promotion in U.S. Changes

He noted that the concept of Japanese canned tuna promotion in the U.S. has changed.

Japan (Contd.):

Now it involves few political problems. U.S. demand for canned tuna is strengthening and the market increasing. Quality and price differences between major U.S. brands and Japanese product are narrowing. It is necessary, therefore, to concentrate on brand promotion. ('Kanzume Nippo,' Apr. 26.)

* * *

CANNED-TUNA PROMOTION WILL BE INCREASED

The Japan Export Tuna Packers Assoc. will increase the budget for canned-tuna promotion in the U.S. and Europe. In the U.S., it is now about US$91,667, contributed equally by government and industry.

Because U.S. domestic packs and other imports compete strongly with the Japanese product, the Association feels a need to review promotion and to develop a combined plan for the U.S. and Europe. The Association is thinking of doubling the present budget. It would allocate about 10% of it to study supply conditions in overseas tuna bases as part of the raw material procurement plan for Japanese packers. ('Kanzume Nippo,' Apr. 21.)

* * *

SLUMP IN CANNED MACKEREL EXPORT PRICE TO PHILIPPINES

Prices for Japanese canned mackerel exports to the Philippines have been dropping in recent months. In mid-April, they slumped to US$4.50 a case, c. & f. Manila, for No. 1 small 100's in tomato sauce ($5.50-5.60 per case in 1968), and to c. & f. $5.30 case for 1-lb. tall 48's natural pack (c. & f. $6.15 a case in summer 1968).

The sharp price reduction was attributed to heavy accumulation of unsold stocks by Japanese trading firms. This put Philippine buyers, who had only limited funds available to set up letters of credit, in a good position to force down prices. ('Suisan Tsushin,' Apr. 19.)

* * *

FISH PASTE ('KAMABOKO') SHIPPED TO U.S.

On April 16, Odome Kamaboko (boiled fish paste) Manufacturing Co. in Nagato, shipped 1,000 pieces of vacuum-packed high-quality 'Kamaboko' valued at US$550 to the U.S. It was the first large shipment of 'kamaboko' to the U.S.

The firm plans to actively promote the product on the U.S. west coast and in Hawaii. Many Japanese-Americans live in these areas. It is made from lizardfish and has a shelf life of about a month. ('Minato Shimbun,' Apr. 17.)

* * *

NEW GILL-NET LONGLINER FISHING IN BERING SEA

The new gill-net longliner 'Tenyu Maru No. 37' (499 gross tons) departed Onahama April 15 on her maiden voyage to the eastern Bering Sea. She was scheduled to operate around St. George Island, east of 175° W. longitude, for about 2 months fishing primarily for Alaska pollock, sablefish, and herring.

Fishing Area Changed

Tenyu Maru had attracted considerable attention from fishermen in northern Japan because her owners previously had announced plans to send her to the eastern Pacific to fish saury off the U.S. west coast.

Equipment

The vessel, equipped with modern navigational devices, is designed to operate under all weather conditions. With the bridge located amidships, she can operate longline and drift-gill-net gear simultaneously. Owned by Ogata Gyogyo Fishing Co., she was built at a cost of about US$722,000 and carries a crew of 27. ('Suisan Keizai Shimbun,' Apr. 15.)

* * *

NEW FISH-FINDER DEVELOPED

Japan's Koden Electronics Co. has developed a fish-finder with a totally new kind of electronic recording system. There are 2 models--a bottom-spread system for bottom trawling, and a range-spread system for mid-water trawling and tuna longlining.

Japan (Contd.):

New Principle

The present fish-finders operate the recording pen mechanically. Koden's device completely eliminates mechanical movement of the pen. It uses an electronic scanning and recording system to control 320 special recording pens, called "multi-pens," lined up in a row like the teeth in a comb. Free control of electronic sweeper circuits connected to the individual pens permits recording to be done by moving the printing paper at proper speeds. With this instrument, various observations previously considered impossible to record can be registered very simply and accurately.

Patents and Prices

Koden has applied for patents in Japan, the U.S., and leading European countries. The product was scheduled to go on sale in May 1969. Prices range from US$1,944 to 5,000. ('Suisan Tsushin,' Apr. 16.)

* * *

SURVEY TEAM RETURNS FROM SURINAM

The 5-man, Japanese government-industry fishery team sent to Surinam for 3-week survey of shrimp and other coastal fishery resources returned to Japan on April 26. The survey was conducted in response to a request by the Surinam Fisheries Director for assistance in developing fishery resources, primarily shrimp, and in constructing shore facilities.

Abundant Resources

The Japanese team found an abundance of shrimp, croaker, skipjack tuna, and other varieties off Surinam. Its members stated that the trip was very meaningful. They will consult with the Fisheries Agency to decide what form of assistance Japan can give. ('Minato Shimbun,' Apr. 29.)

* * *

CONSTRUCTION OF 859 FISHING VESSELS AUTHORIZED IN FY 1968

During fiscal year (FY) 1968 (April 1968-March 1969), the Japanese Government authorized construction of 859 fishing vessels (102,094 gross tons): 569 steel vessels (91,714 tons) and 290 wood (10,380 tons).

Kind of Vessel	No. of Vessels		Gross Tons	
	Steel	Wooden	Steel	Wooden
Distant-water trawlers	19	-	7,257	-
Isei (East China Sea) trawlers	92	-	12,146	-
Offshore trawlers	71	35	4,622	1,199
Tuna vessels	175	76	41,949	4,378
Purse seiners	59	22	5,724	599
Purse-seine auxiliary vessels	29	8	2,310	165
Salmon drift gill-netters	100	32	8,442	1,407
Miscellaneous long-liners	5	47	1,436	1,307
Carriers	2	9	5,000	241
Government vessels	14	4	2,781	140
Others	3	57	47	944
Total	569	290	91,714	10,380

Of steel vessels, 175 (about 30%) were tuna vessels (41,949 gross tons).

Sixty-nine of the steel tuna vessels were 200-300 tons; 41 between 300 & 400 tons; 39 under 100 tons; and 26 between 100-200 tons.

The 290 wooden hulls included 76 tuna vessels (4,378 gross tons). ('Suisan Keizai Shimbun,' May 2.)

日本

South Korea

FISHERY EXPORTS TO INCREASE IN 1969

South Korea has set the 1969 export target for fishery products at US$68 million. This is 9.7% of total export target of $700 million. It is an increase of 33% over 1968's fishery exports of nearly $51 million.

Planned Exports

Among the planned increases for 1969 are: live fish $10 million (up $3 million from 1968), frozen fish $7 million (up $2.4 million), and tuna $21 million (up $4.5 million). Laver at $15 million will be a drop of $2 million. Fishery products are second to manufactured products in the total 1969 commodity export plan. (U.S. Embassy, Seoul, Apr. 4.)

* * *

PLANS TO DEVELOP AQUACULTURE

South Korea has an ambitious aquaculture development plan extending into 1971. It calls for investment of 4,145 million won (about US$15.2 million). It includes cultivation of

South Korea (Contd.):

finfish, shellfish, turtle, and seaweed in inland waters for both domestic and foreign consumption. ('FAO Fish Culture Bulletin,' vol. 1 (2), Jan.)

* * *

ATLANTIC TUNA COMPANY ESTABLISHED

A new fishery company has been set up in Seoul, S. Korea, by the International Basic Economy Corporation (IBEC). It is a joint venture of Transoceanic Fishing Corporation (TFC), a division of IBEC, and TFC's former Seoul manager who is president of the new company. The contract allocates 75% of the shares to TFC. The president gets 25% and an option to buy up to 50% of total shares over the next 10 years.

To Catch Atlantic Tuna

Company assets include two 300-gross-ton tuna vessels. The vessels will catch tuna in the Atlantic and deliver catches to Cape Verde Islands for transshipment to IBEC cannery in Puerto Rico. TFC has operated 3 Korean-crewed tuna vessels under the Panamanian flag for the past 2 years. This operation will be continued jointly with the new company. (U.S. Embassy, Seoul, Feb. 17.)

South Vietnam

POSTWAR FISHERIES EXPANSION PLANNED

Rehabilitation and modernization of the fishing industry will play a prominent role in South Vietnam's 10-year postwar reconstruction programs, according to South Vietnam's Minister of State for Postwar Planning. The statement was made in a press interview in Bangkok, Thailand. Stressing the need for expanding high-seas fisheries, the Minister said that more technicians and modern equipment would be required.

FAO Assistance

With FAO assistance, South Vietnam recently began a high-seas fisheries development and training program. Its fisheries technicians are trained aboard trawlers contributed by Japan and the Netherlands. The first training cruise started in early 1969; other cruises are expected later in the year.

U.S. Aid

The U.S. is contributing aid to reconstruct the Saigon fish market, build cold storage facilities in and around Saigon, rebuild La-Gi fishing harbor, and develop fresh-water fisheries.

North Vietnam

TO REORGANIZE AND EXPAND FISHERIES

North Vietnam will push fishery expansion in 1969, according to an editorial in the Communist Party organ 'Nhan Dan.' There are 2 reasons for the plan: food shortages and a need for foreign currency. Another stimulus is the striking contrast in the last 5 years between progress in fishery development in South and North Vietnam.

Compared with South Vietnam

According to FAO data, North Vietnam's catches increased at about the same rate as South Vietnam's until 1962. Then North Vietnam landed 288,000 metric tons--30% more fish than in 1961--and surpassed South Vietnam's 222,000. After 1962, statistics are available only for South Vietnam, whose 1967 catch reached 410,000 tons. Estimated North Vietnamese catch in 1967 was only about 200,000 tons; it has been going down steadily since 1963. To stop this decline, the Central Committee of the Communist Party has directed a new approach to fishery development. North Vietnam will attempt to increase her catch to about 250,000 tons "in the immediate year."

1969 A Turning Point

North Vietnam's fisheries never have been really developed; 1969 will be the "turning point." Administratively, as in the USSR, both state-owned and cooperative-owned fisheries will be set up. The cooperatives, disorganized now, will be "guided" by the state-owned fisheries. Poor economic management and outdated equipment are the principal "weak

North Vietnam (Contd.):

links." Gear and vessels will have to be mechanized. Shore bases employing local people will be established.

The editorial states that the potential annual yield available to North Vietnam's fishing industry is about 1 million metric tons. ('Nhan Dan,' Mar. 15.)

Taiwan

ASIAN BANK LOANS US$10 MILLION TO BUILD TUNA LONGLINERS

The Asian Development Bank has approved a US$10 million loan to the Republic of China (Taiwan) to build and outfit forty 250-ton tuna longliners. The cost, including interest and working capital, has been estimated at US$16.7 million.

The loan, with an interest rate of 6.9% per year, will be amortized over 13 years, including a 3-year grace period. The proceeds of the loan will be reloaned to approved fishing companies through the Cooperative Bank of Taiwan.

What Project Will Do

The project will contribute significantly to Taiwan's 5-year program to accelerate fishery development. It will enable Taiwan to increase foreign trade and overseas earnings--and to provide jobs for students graduating from maritime colleges and fishing schools. It also will provide better use of shipbuilding and related shore facilities.

Fisheries Bureau's Role

Taiwan's Fisheries Bureau will prepare the technical design of the vessels. The Bureau also will provide technical advice to operating companies, supervise operations, and ensure proper vessel maintenance. Taiwan has the shipbuilding facilities and managerial and technical capabilities to produce 250-ton tuna longliners.

The Vessels

The vessels will be about 43 meters long (141 ft.) overall, 7.5 meters broad (24.6 ft.), and 3.35 meters deep (11 ft.). They will have 700 horsepower main diesel engines and 10.5-knot service speed. The vessels will carry 25 officers and crew, and be able to operate efficiently in all deep-sea areas. Technical equipment will include a complete radio communication system, modern navigation apparatus with radar, fish-finder, and deck machinery. A 50-cubic-meter quick-freezing room will be large enough to handle daily catches; it will freeze fish to -35° C. (-31° F.). Cold-storage rooms will hold about 300 cubic meters of fish at -20° C. (-4° F.).

The vessels will be capable of year-round operation from overseas bases in the Indian or Atlantic Oceans or other fishing grounds. The new deep-sea fishing harbor nearing completion at Kaohsiung will be home base. It will be necessary to return to Taiwan for major overhaul about once every 2 years.

For Export

Ninety-five percent of their annual catch will be exported. Foreign exchange earnings of the 40 vessels may reach about US$5.5 million a year. (U.S. Embassy, Manila, Apr. 1.)

Also, the loan will finance construction of twelve 160-ton high-seas tuna fishing vessels, two 1,500-ton fish carriers, one large purse seiner, several high-seas fishing vessels totaling 8,500 tons, and coastal fishing vessels totaling 3,500 tons. These vessels are scheduled to be built in 1970. ('Suisan Keizai,' Mar. 5.)

Thailand

EXPANSION OF DEEP-SEA FISHERIES PLANNED

The Thai Fisheries Department is urging expansion of deep-sea fisheries. It will loan fishermen 50 million baht (US$2.4 million) to build large trawlers. The money will be advanced by the Asian Development Bank.

Thai Fishing Fleet

At present, Thailand has about one hundred 80-100-ton trawlers suitable for deep-sea fishing. It has about 39,000 fishing vessels in all, including 6,000 trawlers. In 1968, Thailand processed about 139,101 tons of fish for fish sauce.

Thailand (Contd.):

Research and Training

Thailand will cooperate with Denmark to establish a Marine Fishery Research Center at Phuket Island. It should be operational by late June 1970.

In late March 1969, the Southeast Asian Fisheries Development Center approved US$60,000 for a Marine Fisheries Training Department in Bangkok. (U.S. Embassy, Bangkok, Apr. 11.)

Mauritius

SOVIET RESEARCH VESSEL VISITS PORT LOUIS

A 3-ship Soviet naval flotilla had just sailed out of Port Louis harbor and off the front pages of the Mauritian press when another Soviet vessel sailed in with a gift of frozen fish. The fishery research vessel 'Aelita' was returning from 4 months (Nov. 11 to Mar. 15) in the Antarctic. She unloaded 11,000 pounds of fish (mostly Notothenia and Macrophthalma) for hospital patients. A penguin was given to Pokunlall Ramlall, director of the People's College, and president of the Mauritius-USSR Friendship Society.

Chief Scientist Interviewed

The daily 'L'Express' interviewed the chief scientist, Valerii Tod. He said the vessel had been on a mission for a Soviet Fisheries and Oceanography Institute. He warned that commercial fishing around Mauritius by Japanese and Taiwanese boats would eventually kill off big game fishing. He recommended that Mauritius establish territorial limits of 20 miles, at least to protect itself against the Japanese.

Offers Soviet Aid

The scientist stated: "The USSR assists numerous countries in the fishing field at the request of their governments. I don't see why Mauritius doesn't make a similar request. The Soviet Government would never refuse to help such friendly and hospitable people like the Mauritians. The USSR could send research vessels, technicians, and fishing vessels. Mauritians could be given intensive training in new fishing methods. Everything depends on the needs of Mauritius. We are even prepared to take Mauritians fishing in the Antarctic. The USSR has advanced techniques and is thinking of canning tuna in Mauritius for local consumption and for export. One day, perhaps, Mauritians could buy at special low prices Soviet-made ultra-modern fishing boats."

HOW THICK IS THE ICE IN THE ARCTIC OCEAN?

The average thickness of the Arctic ice pack is about 9 to 10 feet, although in some areas it is as thick as 65 feet, with pressure ridges extending downward into the ocean as much as 125 feet.

The atomic submarine NAUTILUS passing beneath the North Pole on August 3, 1968, measured a pressure ridge extending 25 feet down. The depth of the ocean at the North Pole was recorded as 13,410 feet; depths as great as 13,776 feet have been recorded near the Pole.

Ice floes ranging from 7 to 13 feet in thickness have been reported in the Arctic. Icebergs, which are pieces of glacial ice floating in the sea, are many times thicker than sea floes. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

SOUTH PACIFIC

Australia

NORTHERN TERRITORY HAS POOR SHRIMP SEASON

The Northern Territory's first large-scale shrimp season has been a major disappointment. Catches failed to meet more than a third of the cost of operating the 20 trawlers in the fishery. Catches represent only a fraction of expected levels.

The season began early in March. Despite poor returns, companies with millions of dollars invested in trawlers, processing plants, and associated facilities were optimistic that catches would improve later.

Previous Increases

For the six months ending Dec. 1968, shrimp exports increased 52% in weight and 75% in value over 1967 period.

Australian Frozen-Shrimp Exports

	Six Months Ended December			
	1967	1968	1967	1968
	Quantity		Value	
	(1,000 Lbs.)		(A$1,000)	
Destination:				
Japan	1,703	1,222	1,710	1,361
South Africa	184	218	240	313
United States	170	1,486	165	1,755
United Kingdom	164	448	142	525
Other	209	309	186	317
Total	2,430	3,683	2,443	4,271

Note: A$0.89 = $US1.00.

American Samoa

MAY 1969 TUNA PRICES SET

Japanese suppliers and U.S. packers in American Samoa agreed on prices for May 1969 tuna deliveries. Prices per short ton were the same as April's--albacore: frozen US$420, iced $405; gilled-and-gutted yellowfin: frozen $337.50, iced $317.50. The Japanese originally had asked a $15-a-ton price increase for both species. ('Suisan Tsushin,' May 18.)

* * *

NEW MINIMUM WAGES SET FOR FISHERY WORKERS

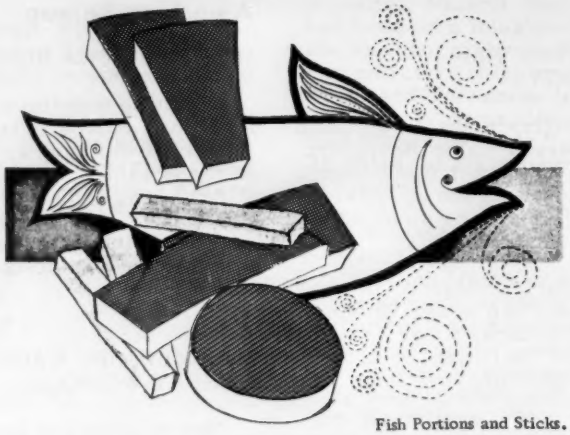
New minimum wage rates for fishery workers (among others) in American Samoa have been announced by the U.S. Department of Labor. The rates apply to about 2,500 workers in private industry, schools, and hospitals; most of the rates are slated for another increase in one year.

The rates were recommended by an Industry Committee of employers, employes, and public. The committee was authorized to recommend minimum wage rates required by the Fair Labor Standards Act.

The New Rates

Minimum wage rates for the Fish Canning and Processing and Can Manufacturing Industry are: $1.15 beginning June 5, 1969, and $1.20 beginning June 5, 1970.

FOOD FISH FACTS



Fish Portions and Sticks.

Within the last decade an entirely new line of frozen food products has entered the consumer market. The success of these products has been tremendous. Today's homemaker has a selection of food in easy-to-prepare forms that were unknown 10 years ago. Along with many others, frozen convenience seafoods have become popular throughout the nation, with fish portions and sticks leading the field.

As an example of how fish portions and sticks have caught on in the United States, statistics compiled by the Bureau of Commercial Fisheries show that from a beginning in the mid '50s, the combined production of fish portions and sticks in 1968 rose to over 270 million pounds. This figure continues to grow as additional drive-ins, restaurants, schools, institutions, and homemakers are introduced to these convenience seafoods.

DESCRIPTION

Fish portions and sticks are generally made of cod, haddock, or pollock and come in frozen, raw or partially-cooked forms. Fish portions can be obtained either breaded or unbreaded. They come in a variety of sizes and shapes to meet the requirements of different markets. Portions and sticks are cut by machine from large, solidly-frozen blocks of fish fillets. The cut pieces are dipped into a batter and coated with breading. Most fish sticks and some portions are then partially cooked. Partially-cooked fish portions and sticks take only minutes to prepare. Uncooked portions and sticks take slightly longer. For best results, follow the directions on the package for cooking time and temperature.

Fish portions range in size from $1\frac{1}{2}$ to more than 5 ounces and come in square, round, and rectangular shapes. Generally speaking, one 8 or 10 ounce package of fish portions will serve two. Raw breaded fish portions are at least $\frac{3}{8}$ inch thick and contain not less than 75 percent fish. Partially-cooked fish portion are at least $\frac{3}{8}$ inch thick and contain not less than 65 percent fish.

Fried fish sticks are 3 to 4 inches long and weigh up to $1\frac{1}{2}$ ounces. They are at least $\frac{3}{8}$ inch thick and contain not less than 60 percent fish. An 8-ounce package will make two servings.

(Continued following page.)

PURCHASING TIPS FOR FROZEN FISHERY PRODUCTS

Check carefully to see that the container is intact.

Avoid packages which have been stacked above the "load line" or "frost line" of the freezer.

Take only those packages which are solidly frozen.

Check for "drip" or ice on the outside of the package. This may indicate that the contents have thawed and been refrozen.

In buying cello-wrap packages, check for discoloration or other signs of freezer burn.

Frozen fish should have little or no odor; a strong fish odor means poor quality.

Within a few short years frozen fish portions and sticks have become an American standard, being featured as "fishburgers" or fish sandwiches in drive-ins and restaurants across the land. Volume feeding operations have incorporated portions and sticks into their menus with great success. Today's homemakers are preparing practical portions and sticks in a variety of imaginative ways for family dining.

Fish portions and sticks are a product of our rapidly changing society and it appears that their future is rosy, as producers, wholesalers, retailers, and consumers are shaping their activities around the convenience food product. (Source: National Marketing Services Office, BCF, U. S. Department of the Interior, 100 East Ohio, Rm. 526, Chicago, Illinois 60611.)

(Recipe on p. 74.)

IT'S SUMMER--DO YOUR THING WITH SEAFOOD

It's summer and you're tired of spending hours in the kitchen. Right? Okay, get out and enjoy the summer air and allow yourself to live a little. How? Here's how--explore the wonderful world of quickly-prepared, convenience seafoods. A wide selection of ready-in-minutes fishery products can be found in the frozen seafood section of your market, ready and waiting to please and nourish your family.

Of all the seafood convenience products on the market today, fish sticks and portions have grown the fastest, according to the Bureau of Commercial Fisheries. Nearly 92 million pounds of fish sticks and more than 179 million pounds of fish portions were produced during 1968. This was a record year for both products. The increased consumer acceptance of these products is probably because the fishing industry and the Bureau are constantly striving to advance product development as well as improving freezing, packaging, and storing methods.

Fish portions and sticks are generally cut from frozen blocks of cod, haddock, or pollock fillets. They may be bought raw or partially cooked, usually breaded, and frozen. These products should not be thawed before cooking which saves time for the busy homemaker. Shapes of portions and sticks vary from square or round to the more popular rectangular shape and range in weight from 1 to 5 ounces.

Fish Barbecue, a Bureau of Commercial Fisheries tested recipe, is a satisfying treat with an interesting new approach in preparation. Instead of first being fried, then served with a sauce on a bun, this unusual recipe allows the portions to absorb the tangy flavor of the easily-made barbecue sauce by being simmered in the sauce. Try it out on those hungry people around your house. Fish Barbecue will be a favorite and--you can take time out to live a little!

Fish Barbecue

6 frozen raw breaded fish portions ($2\frac{1}{2}$ to 3 ounces each)

6 poppy seed twist rolls, toasted

Barbecue Sauce

Place frozen portions in a single layer in hot Barbecue Sauce in a 12-inch fry pan. Cook over low heat for 8 to 10 minutes. Turn carefully. Cook 8 to 10 minutes longer or until fish flake easily when tested with a fork. Serve on rolls. Makes 6 servings.

Barbecue Sauce

$\frac{1}{4}$ cup chopped onion

2 tablespoons butter or margarine, melted

$1\frac{1}{2}$ cups catsup

$\frac{1}{4}$ cup brown sugar

$\frac{1}{4}$ cup vinegar

2 tablespoons lemon juice

2 tablespoons Worcestershire sauce

$\frac{1}{4}$ teaspoon salt

Cook onion in butter until tender in a 12-inch fry pan. Add remaining ingredients. Heat. Makes approximately 2 cups sauce.

The Bureau of Commercial Fisheries, United States Department of the Interior, has a full-color recipe booklet that shows you how to save time. Time for Seafood (I 49.49/2:12) Fishery Market Development Series No. 12, costs 45¢ and is filled with quick-fix fish and shellfish recipes that are certain to get the busy homemaker out of the kitchen in record time.

Another Bureau booklet, Fish for Compliments on a Budget (I 49.49/2:9) Fishery Market Development Series No. 9, costs 15¢ and contains time and budget-saving recipes. Both are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 E. Ohio, Rm. 526, Chicago, Ill. 60611.)

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HOW DEEP IN THE OCEAN CAN ONE SEE WITH NATURAL SUNLIGHT?

Even when perfectly clear, water is at least a thousand times more opaque than air, because of the density difference. The depth to which one can see in the ocean is dependent on the amount of suspended matter and the angle of sunlight. Underwater visibility is best at noon when the sun is directly overhead; at that time about 98 percent of the light penetrates the sea surface. When the sun is at an angle of 10 degrees above the horizon, only 65 percent of the light penetrates; the rest is reflected.

Tropical waters usually have high transparency; the Mediterranean Sea, particularly the eastern section, is also noted for its good transparency characteristics.

As a diver descends into the ocean, the first change he notices is that everything appears to be blue-green; when he approaches the 100-foot level, it becomes impossible to distinguish colors. Light appears to come from all directions and there are no shadows. Cousteau reports that at 300 meters the pale blue lighting is hardly sufficient to define the shapes of objects a short distance away.

Sometimes horizontal visibility is better at greater depths because of the higher amounts of suspended materials in surface waters. Italian divers working on the liner 'Egypt' southwest of Brest, France, reported that visibility diminished as they went to a depth of 66 feet, then improved. Light faded as they reached the wreck at 396 feet; at that depth, visibility was 6 feet. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

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